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WAR MACHINE

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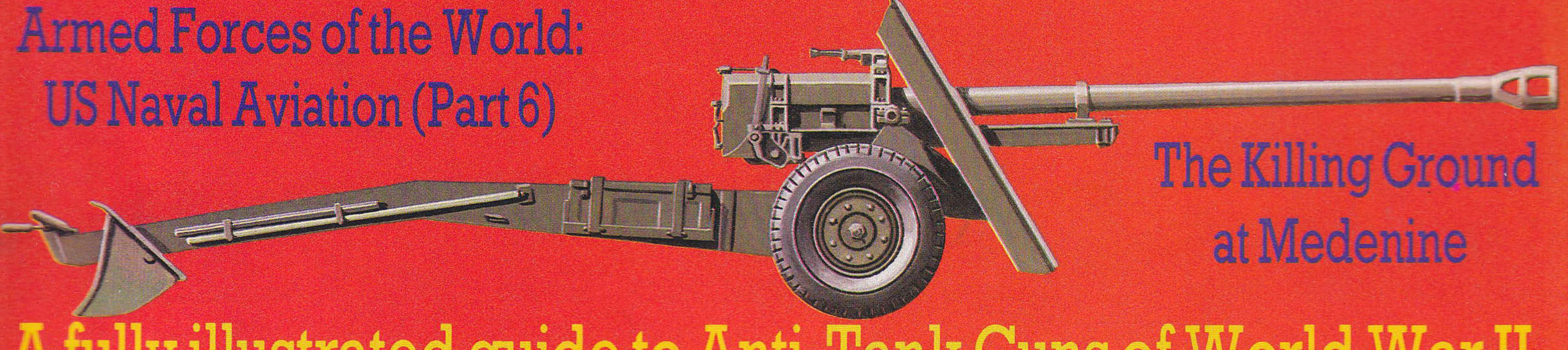
Anti-Tank Gun Tactics – 1944

'88' in Action

Armed Forces of the World:
US Naval Aviation (Part 6)



The Killing Ground
at Medenine

A fully illustrated guide to Anti-Tank Guns of World War II

WAR MACHINE

Volume 4 **Issue 46**

CONTENTS

Anti-Tank Guns of World War II

Ordnance, Q.F., 2 pdr 902
Ordnance, Q.F., 6 pdr 902
Ordnance, Q.F., 17 pdr 903
The Killing Ground at Medenine 904
Skoda 47-mm kanon P.U.V. vz 36 anti-tank gun 906
3.7-cm Pak 35/36 906
5-cm Pak 38 907
7.5-cm Pak 40 908
'88' in Action 909
8.8-cm Pak 43 and 8.8-cm Pak 43/41 912
Taper-bore anti-tank guns 914
47-mm Anti-tank Gun Type 1 915
Böhler 4.7-cm anti-tank gun 915
Soviet 45-mm guns 916
Anti-Tank Gun Tactics – 1944 917
Soviet 76.2-mm anti-tank guns 918
37-mm Antitank Gun M3 918
3-in Antitank Gun M5 919
25-mm anti-tank guns 919
Canon de 47 antichar SA mle 1937 920

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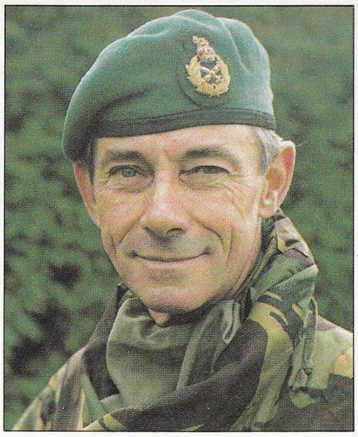

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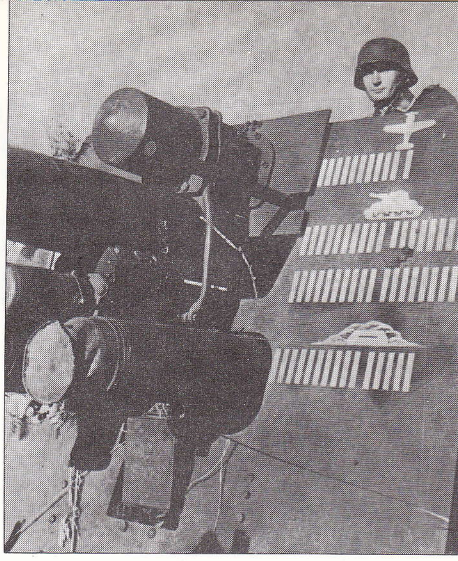
Anti-Tank Guns of World War II



The characteristic high-velocity flat trajectory of anti-tank weapons was equally effective against aircraft, and armour-piercing shot could also deal with concrete. Hence this 8.8-cm flak gun displays a score of 11 aircraft, 40 tanks and 15 pillboxes destroyed.

The few years prior to and during World War II saw the anti-tank gun make a significant entry into the battlefield. Few realized that within a short time the recoilless rifle and guided missile would in turn come to the fore and the specialist anti-tank gun would virtually disappear.

The anti-tank gun was an important weapon during World War II, for it was the only weapon that could destroy the tank at ranges beyond those of the much smaller hand-held anti-tank weapons such as the grenade or bazooka. When the war started the anti-tank gun was a small weapon, virtually a miniature version of larger field pieces. By 1945 the type had grown rapidly into large and heavy guns that sometimes dwarfed the field pieces. Their power had grown as well, for while the guns of 1939 were able to punch their way through armour only about 25 mm (1 in) thick, by 1945 they were required to have an effect on armour about 100 mm (3.94 in) thick, and to do so at ranges well in excess of those prevalent in 1939. At the beginning of the war 400 m (440 yards) was considered to be the top limit to an anti-tank gun's capabilities but by 1945 ranges of 2000 m (2,190 yards) or more were not uncommon.

Along with the increase in calibre, size, weight and performance went a corresponding escalation in projectile performance. The gun is really only the delivery system for the projectile which is the anti-tank gunner's weapon, and the degree of development to which the anti-tank projectile was subjected to between 1939 and 1945 can only be sketched in these pages. Suffice it to say that the steel shot of 1939 had given way to the tungsten core of 1945, and even the very shape of the projectile had changed radically. The hollow- or shaped-charge projectile was also introduced to bring chemical energy into the gun-versus-armour conflict.

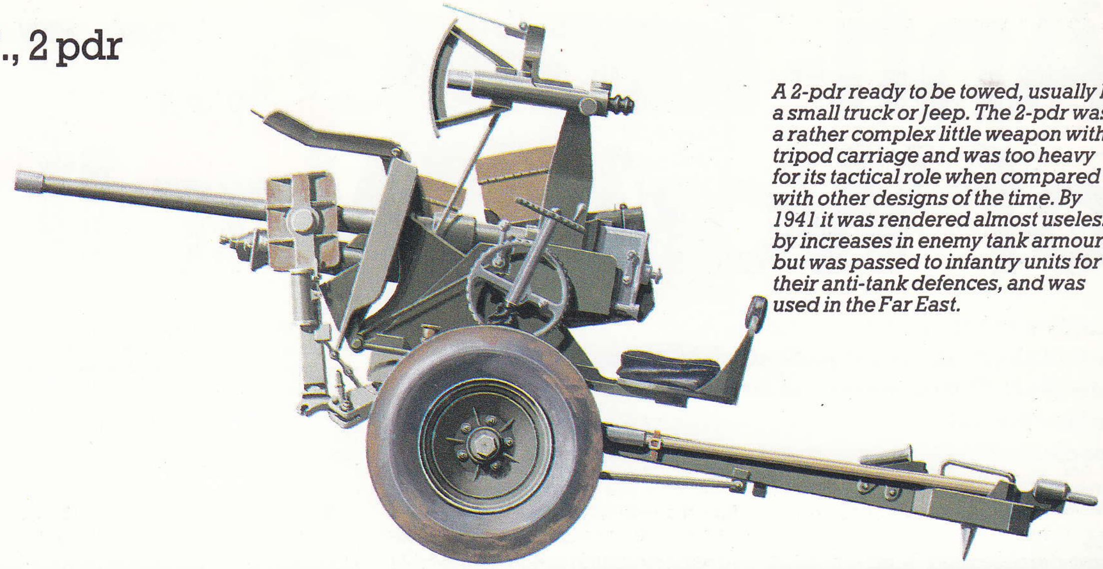
The war waged by the anti-tank gun was a specialized one with only one real objective: the destruction of tanks. The role of the anti-tank gunner was to serve the gun, to aim it and to fire it at the right moment, and with many of the guns mentioned here this was far from easy. All too often the target had to be allowed to approach very close, requiring of the gun crew nerve, courage and good training, so the role of the gunner must not be forgotten under the weights of fact and detail. It is impossible to define exactly which gun was best at any period, for even the finest gun has to have a man or crew to use it and on many occasions a good man or crew could provide results far better than those of others using theoretically better weapons. Thus a British 6-pdr could often have more influence on a battle than a German '88', for it was the man that mattered in the end, not the weapon.

This apart, the anti-tank gun in World War II is a fascinating study in development and design. It is a weapon that has now virtually disappeared from use, but World War II was its heyday.

German production of anti-tank weapons included advanced taper-bore weapons, designed to have a high muzzle velocity. The German invasion of the Soviet Union and subsequent experience of the famous T-34 tank ensured that the taper-bored 4.2-cm Pak 41, seen here in action in 1942, would be welcome. In common with much German weaponry, however, the guns and ammunition were costly to produce and served in small numbers.

UK

Ordnance, Q.F., 2 pdr



A 2-pdr ready to be towed, usually by a small truck or Jeep. The 2-pdr was a rather complex little weapon with a tripod carriage and was too heavy for its tactical role when compared with other designs of the time. By 1941 it was rendered almost useless by increases in enemy tank armour, but was passed to infantry units for their anti-tank defences, and was used in the Far East.

The **2-pdr** anti-tank gun (or more formally the **Ordnance, Q.F., 2 pdr**) is one of those unfortunate weapons that has been given a bad reputation for no real reason other than it had to be used at a time when it was no longer a viable weapon. In its day it was as good as, if not better, than any contemporary design, but the rapid increases in tank armour thicknesses during the late 1930s rendered it obsolete just at a time when it was being placed into widespread service.

The 2-pdr had its origins in a British staff requirement dated 1934. Much of the original development was carried out by Vickers-Armstrongs, and the first guns and carriages were produced for commercial sales. Some went to Spain, but the main recipient was the British army which received its first examples during 1938. Further development was required until the full army specification could be met and it was not until 1939 that the most commonly encountered carriage (the Carriage, 2 pdr, Mk III) was issued.

Compared with many other designs then in existence the 2-pdr was a complex piece of ordnance and it was almost twice as heavy as any other gun in its class. The main reason for this weight was the carriage which, in action, rested on a low tripod carriage that provided the gun with 360° traverse. A high shield was provided for the gun crew and there was provision for an ammunition chest to be carried on the back of the gun shield. The philosophy behind the design differed from contemporary thought as well. Many European armies intended the anti-tank gun to be used in a mobile attacking role, but the 2-pdr was intended for use in static defensive positions. The type was also manned by specialist anti-tank personnel from the Royal Artillery.

The events of 1940 showed the 2-pdr to be at best obsolescent, and the BEF had to leave the bulk of its 2-pdr guns behind at Dunkirk. The gun lacked the power to punch through the thick armour of most of the German tanks, and the effective range was too short for tactical comfort; the projectiles were too light to cause damage at ranges outside the machine-gun range of the target tanks, and many gun crews were thus decimated before they could fire a useful shot. But in the United Kingdom the production facilities to produce any modern form of anti-tank gun for the army that was almost devoid of any form of defence against tanks was quite simply not available. Industry had therefore to carry on producing the 2-pdr at a time when it was realized that it was no longer an effective weapon. The results of this had to be borne during the North African campaigns of 1941 and 1942, when the 2-pdr proved to be almost useless against the Afrika Korps, to the extent that the 25-pdr field piece had to be used for anti-tank work in its place. All manner of remedies to make the 2-pdr more successful were tried, one measure being the placement of the gun on the back of an open truck to provide a mobile platform, and another the development of the Littlejohn Adaptor, a squeeze-bore device attached to the muzzle and firing special skirted projectiles to improve projectile performance. Neither of these measures saw much use, and after 1942 the 2-pdr was withdrawn from use and passed to infantry units for their anti-tank defences. The type did not remain in use for long in that role, but in the Far East the 2-pdr remained in service until 1945, for there the target tanks were lighter and the gun could still cope with them.

Specification

Ordnance, Q.F., 2 pdr

Calibre: 40 mm (1.575 in)

Length of piece: 2.0815 m (6 ft 9.9 in)

Length of rifling: 1.6723 m (5 ft 5.84 in)

Weight: complete 831.6 kg (1,848 lb)

Traverse: 360°

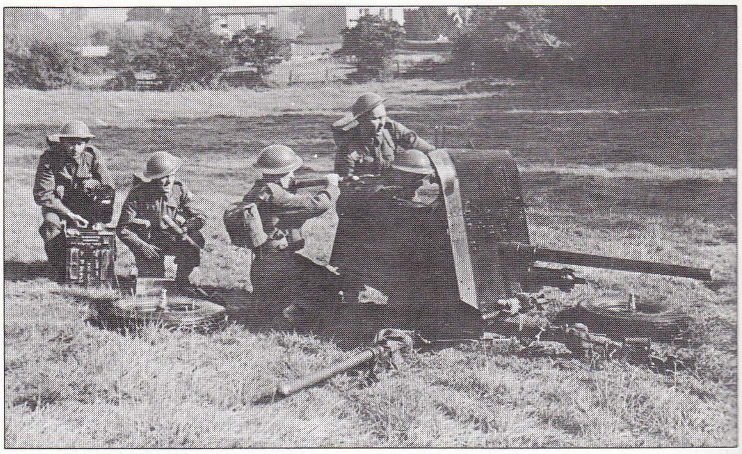
Elevation: −13° to +15°

Muzzle velocity: AP 792 m (2,626 ft) per second

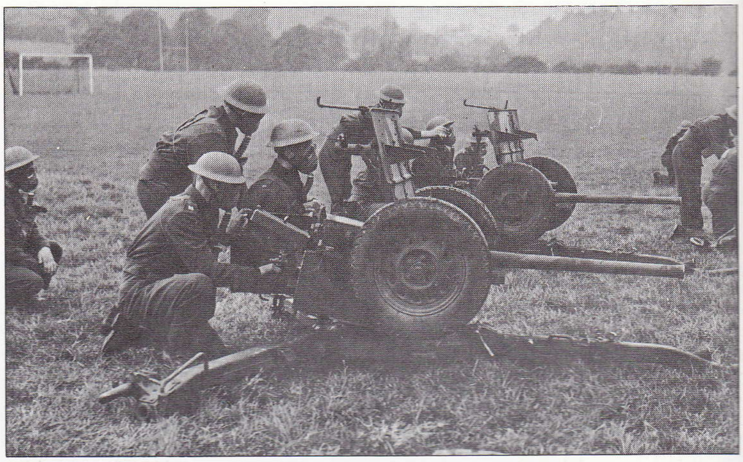
Maximum effective range: 548 m (600 yards)

Projectile weight: 1.08 kg (2.375 lb)

Armour penetration: 53 mm (2.08 in) at 455 m (500 yards)



Right: A drill-book photograph of a 2-pdr gun and crew in action with the gun about to be loaded. Note that the ammunition is being passed from a box to the rear as the box on the gun shield was for emergencies only.



2-pdr gun crews undergo training during a chemical warfare exercise. The gun in the foreground shows the ammunition box carried on each gun, but later marks were able to remove the road wheels to aid concealment.

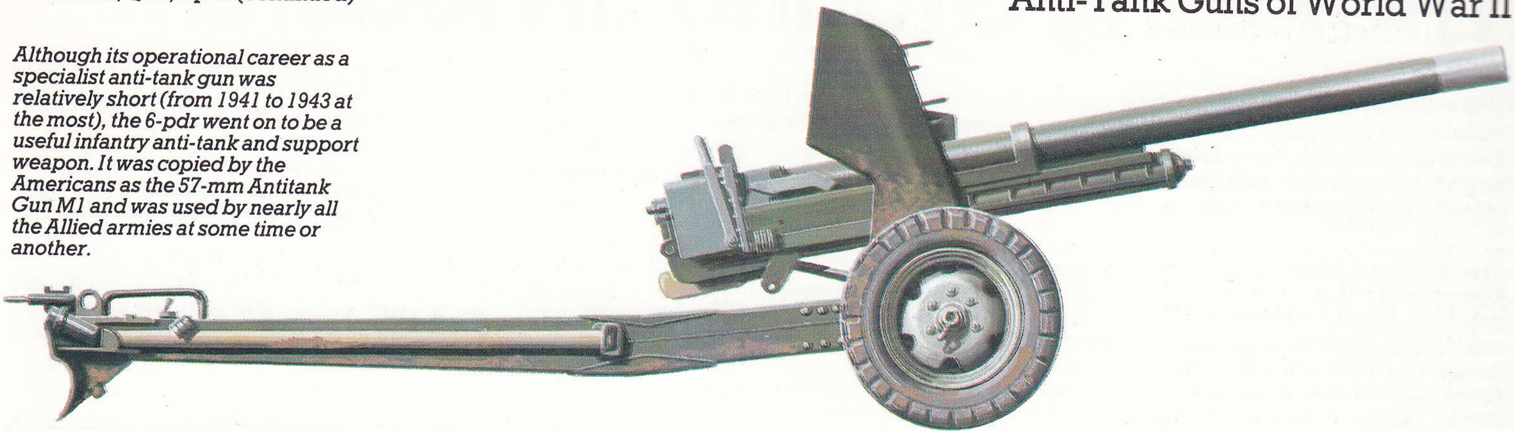
UK

Ordnance, Q.F., 6 pdr

British weapon planners had foreseen the need for an anti-tank gun more powerful than the 2-pdr as early as April 1938, but it took time to develop and then to produce the new gun. During late 1940 production was delayed as 2-pdr guns occupied the production lines, so that it was not until late 1941 that the new gun reached the troops. This new gun had a calibre of 57 mm (2.244 in) and fired a projectile weighing about 6 lb (2.72 kg) so the new gun was known as the **6-pdr**.

By the time the 6-pdr reached the troops it was sorely needed, and once in action it proved to be effective against the enemy tanks then in use. Compared with the 2-pdr the 6-pdr was much more conventional, and used a split-trail carriage that gave a useful 90° traverse. There were two main variants, the **Ordnance, Q.F., 6 pdr Mk II** and **Ordnance, Q.F., Mk IV**; the **Ordnance, Q.F., 6 pdr Mk I** was used for training only, and the Mks III and V were tank guns. The main difference between the Mks II and IV was barrel length, that of the Mk IV being slightly longer. Some slight carriage variations were produced but the most drastic was the Carriage, Q.F., 6 pdr, Mk III, which was developed for use by airborne units. This was narrower than the norm and the trail legs could be shortened for stowage in gliders; numbers of these special conversions were used at Arnhem.

The 6-pdr provided some sterling service in North Africa, but once the Tiger tank appeared on the scene it was realized that the day of the 6-pdr was almost over, for the 2.85-kg (6.28-lb) projectile was unable to penetrate the thick frontal armour of the Tiger and only a lucky shot to the side could be effective. So the 6-pdr was gradually withdrawn from Royal Artillery use from 1943 onwards. They were issued



Although its operational career as a specialist anti-tank gun was relatively short (from 1941 to 1943 at the most), the 6-pdr went on to be a useful infantry anti-tank and support weapon. It was copied by the Americans as the 57-mm Antitank Gun M1 and was used by nearly all the Allied armies at some time or another.

instead to infantry anti-tank companies and with the infantry the 6-pdr saw out the war. Many were supplied to the Red Army.

The Soviets were not the only recipients of the 6-pdr, for the type was adopted by the Americans also. When the Americans realized that they too would need a heavier anti-tank gun than their 37-mm (1.46-in) M1 they saw that the easiest way to produce something was to copy the 6-pdr, and in early 1941 they obtained a set of drawings from the British and adapted them to suit their own production methods. The result was the **57-mm Antitank Gun M1**. At first the American carriage had a handwheel traverse in place of the shoulder pad of the British original, but in time the Americans adopted the shoulder pad also and in this form the **M1A2** was used until the war ended in 1945. But it was as a weapon mounted on a self-propelled carriage that the American gun was most important. Large numbers of M1 guns were produced for mounting on half-tracks and in this form the American guns were widely used by the British army and many other Allied forces as well as by the US army.

The 6-pdr may have been outclassed by heavy tanks such as the Tiger, but against nearly all other German tanks it proved to be effective enough. It was also a relatively light and handy weapon and served on with many armies for long after 1945.

Specification

Ordnance, Q.F., 6 pdr, Mk IV
Calibre: 57 mm (2.244 in)
Length of piece: 2.565 m (6 ft 8.95 in)
Length of rifling: 2.392 m (7 ft 10.18 in)
Weight: complete 1112 kg (2,471 lb)
Traverse: 90°
Elevation: −5° to +15°
Muzzle velocity: 900 m (2,700 ft) per second
Projectile weight: 2.85 kg (6.28 lb)
Armour penetration: 68.6 mm (2.7 in) at 915 m (1,000 yards)

31 May 1942, and a truck-mounted 6-pdr goes into action near Tobruk. Within a month Rommel would have taken the town, and at the same time forced the 8th Army back towards Mersa Matruh and El Alamein.

UK

Ordnance, Q.F., 17 pdr

By 1941 the rapid increase in the armour protection of tanks was being forecast to the extent where it was realized that not even the 6-pdr would be able to cope. To deal with the expected armour increases it was decided to produce the next generation of anti-tank guns with a calibre of 3 in (76.2 mm) to fire a projectile weighing no less than 17 lb (7.65 kg). It was realized that the resultant gun would be a fair-sized piece of artillery but at the time there seemed to be no other option open, and the development of the gun proceeded with haste.

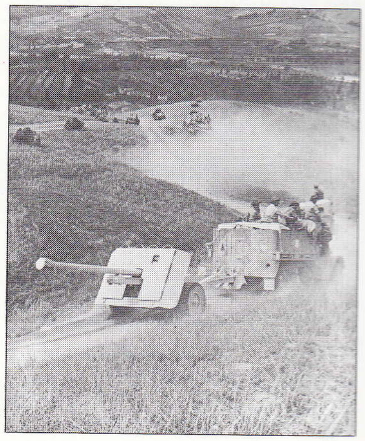
The first guns, soon known as the **Ordnance, Q.F., 17 pdr** or **17-pdr**, were made as early as August 1942 but these guns were prototypes only and getting the gun into full production took more time. This was to have dramatic results for from North Africa came news that the first consignment of Tiger tanks was expected in the theatre in the very near future. At that time some guns were ready but they had no carriages. To get some form of heavy anti-tank weapon into the hands of the troops it was decided to fly 100 guns to North Africa, where they were hastily fitted onto 25-pdr field gun carriages to produce a hybrid known as the **17/25-pdr**. The conversions were made just in time, for a few weeks later the first Tigers appeared and the 17/25-pdr was on hand to tackle them. These 17/25-pdr guns served until 'proper' 17-pdr guns were to hand during the early stages of the Italian campaign in 1943.

When the 17-pdr guns arrived they were indeed a fair-sized weapon but the overall design was low and not too cumbersome. The carriage had long and angled split trails and a large double-thickness armoured shield was fitted. The gun was proportionately long, and was fitted with a muzzle brake and a large and heavy vertical block breech mechanism. To handle the gun a detachment of at least 7 men was required, and more were needed if any man-handling was necessary. But in mitigation of this factor the gun proved capable of firing a projectile that could penetrate any enemy tank at long ranges and the rate of fire was such that 10 rounds per minute were not uncommon.

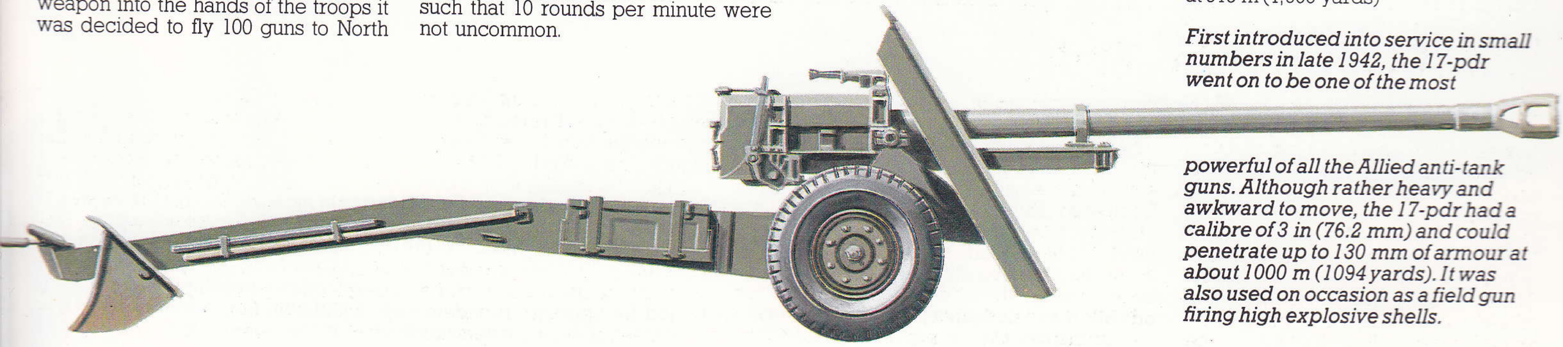
By 1945 the 17-pdr was the standard anti-tank gun of the Royal Artillery anti-tank batteries and many had been handed on to Allied armed forces. The 17-pdr proved to be the last of the British Army's conventional anti-tank guns (a 32-pdr with a calibre of 94 mm/3.7 in was proposed but a 120-mm/4.72-in recoilless gun was selected instead), and many served on until the 1950s with the British army. The gun appears in the inventories of many current armed forces. Various types of 17-pdr tank guns were produced as well.

Specification

Ordnance, Q.F., 17 pdr
Calibre: 76.2 mm (3 in)
Length of piece: 4.4425 m (14 ft 6.96 in)
Length of rifling: 3.562 m (11 ft 8.25 in)
Weight: in action 2923 kg (6,444 lb)
Traverse: 60°
Elevation: −6° to +16.5°
Muzzle velocity: 950 m (2,900 ft) per second
Projectile weight: 7.65 kg (17 lb)
Armour penetration: 130 mm (5.12 in) at 915 m (1,000 yards)



By September 1944 the 17-pdr had proved an extremely effective weapon, and in the 8th Army's assault on the Gothic line was well to the fore to deal with German heavy armour.



First introduced into service in small numbers in late 1942, the 17-pdr went on to be one of the most powerful of all the Allied anti-tank guns. Although rather heavy and awkward to move, the 17-pdr had a calibre of 3 in (76.2 mm) and could penetrate up to 130 mm of armour at about 1000 m (1094 yards). It was also used on occasion as a field gun firing high explosive shells.

The Killing Ground at Medenine

The early stages of the struggle between the Afrika Korps and the British were notable for the flexible and effective use of armour and anti-tank resources by the Germans. The 8th Army learned some hard lessons, and the drive from El Alamein saw the chance to put them into effect. The approach to Tunisia in early 1943 saw the one-time pupils demonstrate their mastery, most notably at Medenine.

The Battle of Medenine that took place in March 1943 was noteworthy for several reasons. One of them was that the battle marked the end of what may now be regarded as the Desert War, for Medenine lies on the approaches to the more built-up and mountainous terrain of Tunisia, with the wide expanses of the North African desert well to its east. Another point was that Medenine was the first major use of the tank 'killing ground', something that was not entirely new but which was being used at Medenine for the first time on a large scale. The killing ground concept may be defined as the use of an area into which an enemy attack can be channelled or directed, there to be stopped and crushed by the use of defensive measures preplanned by the defender. The use of such a killing ground allows the defender to fight the defensive battle on his terms, not those of the enemy.

The only snag with this simple concept is that it takes time to prepare. The defensive measures have to be emplaced and some form of channelling or diversion of the enemy's path has to be formulated. At times the enemy's path and tactics may be known and thus it was at Medenine. The British 8th Army had been halted at Medenine after a long advance across the North African desert, but supplies had run down and were dependent on a long chain running across the desert, and the Germans had been putting up their usual spirited defence as they fell back. The original Allied objective had been to link up the 8th Army advancing from the east with the 1st Army that was advancing from the west following the successful Allied landings in North West Africa during Operation 'Torch'. When the halt at Medenine was made the two Allied armies were still some 400 km (250 miles) apart, but if the two could join they would form a ring that would contain the Axis forces in Tunisia. Thus the halt at Medenine provided the Germans with an opportunity to attack the 8th Army, put it off balance and so provide time for the Axis forces either to attack the 1st Army or simply to prolong the campaign and build up their own defences. They decided to lay on a major attack on a corps front, and selected for the purpose the area occupied by the three divisions of XXX Corps.

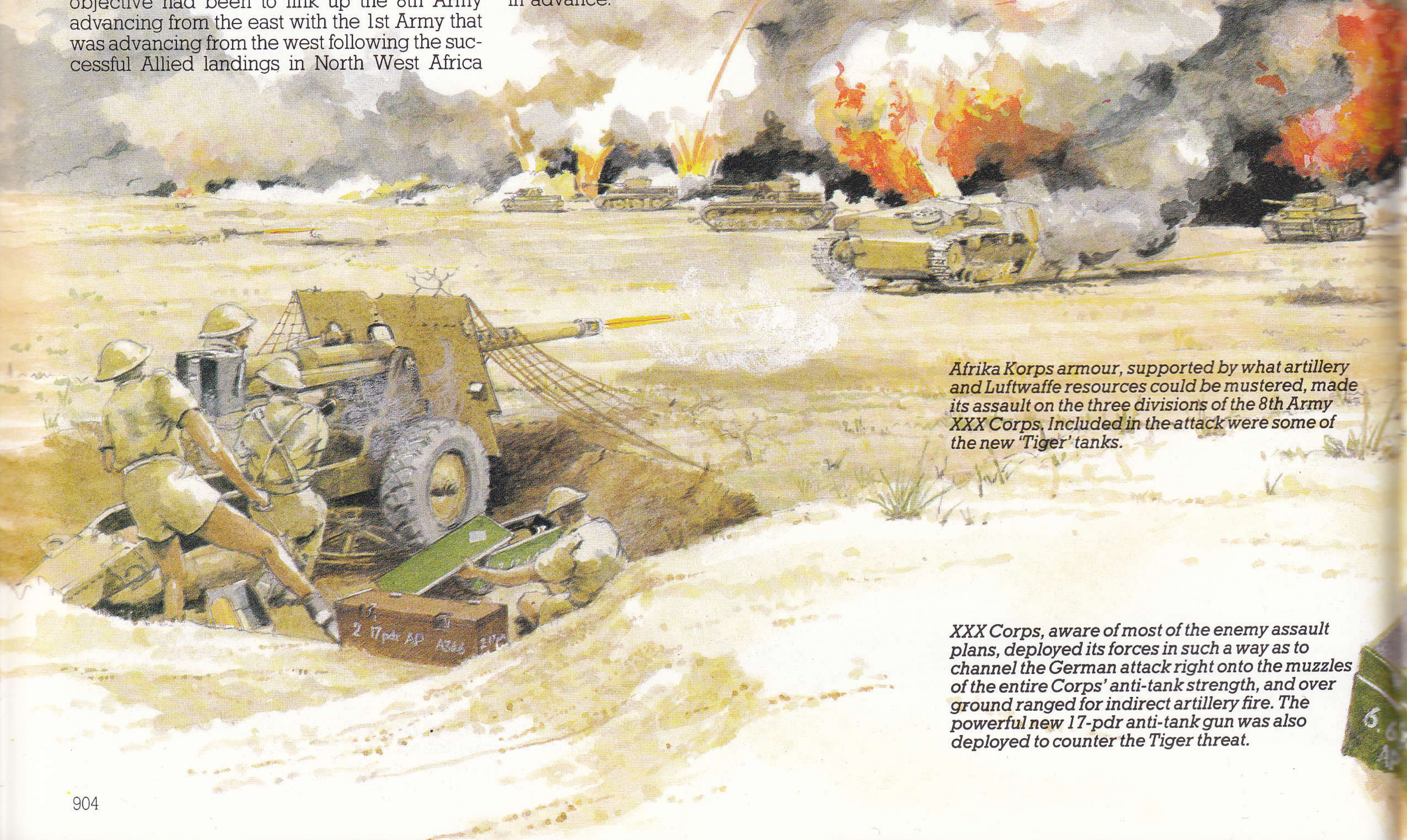
'Ultra' takes a hand

Unfortunately for the Germans their plans were detected at an early stage. The overall plan was detected via the 'Ultra' signal interception system and the purely local details were discovered either from local reconnaissance or the interrogation of prisoners. Thus the British forces had plenty of time to formulate their defensive measures. For various reasons it was known that the Germans had to make a frontal attack in place of their usual ploy of a feint to the front followed by a wide sweep around the flank. The attack would be entirely conventional, would be prefaced by the usual artillery preparation and would be supported by what was left of the once-active Luftwaffe and by as many tanks as the Afrika Korps could muster. Even the date of the attack was known in advance.

In their turn the Germans had little idea of what was awaiting them. The XXX Corps preparations were thorough, and there was time to carry out their measures in detail. The main defences rested upon two elements. One was the use of a carefully drawn-up fire plan by the artillery of the entire corps and the other was the use of anti-tank guns located well forward. These guns were to be emplaced and carefully concealed with only one thing in mind: they were there to kill tanks and any thoughts of protecting infantry positions or the like had to be forgotten.

Countering the Tiger

The anti-tank guns involved were almost all 6-pdr weapons, though scattered among them were numbers of the novel 17/25-pdr guns that were to see action for the first time on a large scale. These guns were conversions of 25-pdr field gun carriages to accommodate the long 17-pdr barrel, and the conversion programme had been rushed through in the anticipation that the new German Tiger tanks would be making their appearance in North Africa in the very near future, it already being known that the 6-pdr lacked the punch to penetrate the thick frontal armour of the Tiger. The 17-pdr system had been designed and developed for just this task, but in early 1943 there were none to hand. Some numbers of 17-pdr barrels had been produced, but production of the large and complex carriages had been held up. Thus when news of the arrival of the Tigers in North Africa filtered through the 'Ultra' intelligence network the need for something to counter them became acute. The solution was to fly out 100 17-pdr guns to North Africa, and there they were placed onto 25-pdr carriages at army



Afrika Korps armour, supported by what artillery and Luftwaffe resources could be mustered, made its assault on the three divisions of the 8th Army XXX Corps. Included in the attack were some of the new 'Tiger' tanks.

XXX Corps, aware of most of the enemy assault plans, deployed its forces in such a way as to channel the German attack right onto the muzzles of the entire Corps' anti-tank strength, and over ground ranged for indirect artillery fire. The powerful new 17-pdr anti-tank gun was also deployed to counter the Tiger threat.

workshops. The result was a rather unhandy gun that looked and probably was rather unbalanced, but firing trials demonstrated the viability of the conversion and the weapons were rushed to the front line. They were just in time, for the Tiger did appear during the Medenine battle.

While these two anti-tank guns formed the main anti-tank screen, the infantry positions were defended by numbers of the little 2-pdr guns which were by then of very limited value but better than nothing, and it was hoped in any event that the enemy tanks would not get as far as the infantry positions, though if they did the infantry could also rely on the firepower of the corps field and medium artillery, which also covered the anti-tank gun position and so added weight to the fire in the planned killing ground.

The killing ground

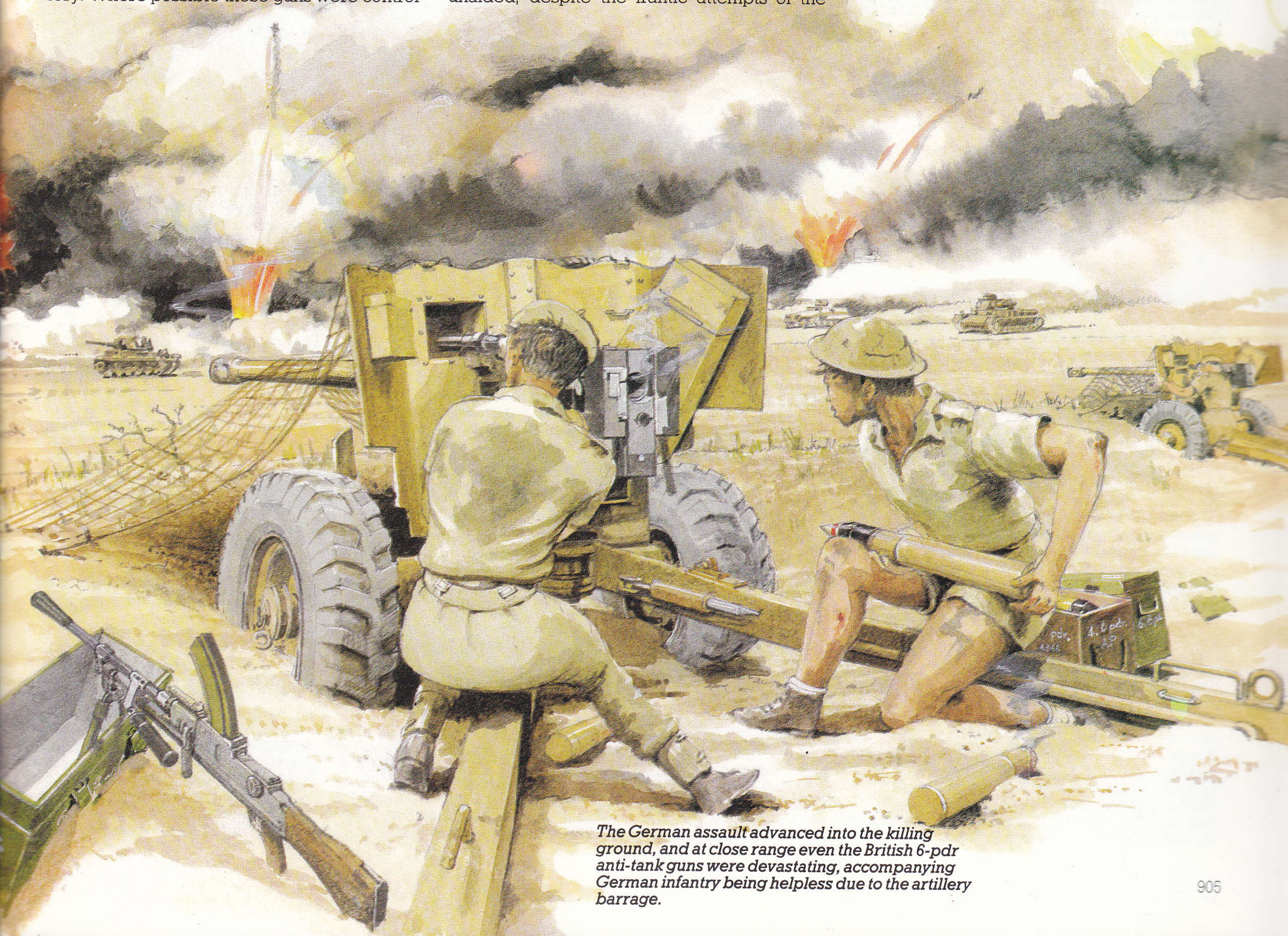
When the attack came on 6 March all was ready. The Germans appear to have had no idea of what they were advancing into, and following the expected artillery preparation the tanks and infantry of the 10th, 15th and 21st Panzer divisions plus supporting formations were allowed to advance to within 100 m (110 yards) of the anti-tank gun screen. This screen was not laid out on any linear basis but was carefully emplaced and concealed in positions that made the best use of any local cover. Thus although some guns were emplaced to fire directly to the front, some were placed in enfilading positions firing along the front. Most were emplaced and organized as batteries, nearly all of them manned by the Royal Artillery. Where possible these guns were controlled as batteries, but on many occasions the individual gun crews were able to select their own targets.

The Germans advanced directly against the centre of the three divisions of XXX Corps. Once they were within the prepared range the guns opened up. The close range had been selected for two reasons: firstly, at such close ranges the 6-pdr guns could be used to best effect as their performance fell away as the range increased; and secondly, to entice as much of the enemy's armour into the killing ground as possible. Once within the area their chances of getting out were much reduced. The result was a virtual slaughter of the German tanks (35, 60 and 46 respectively by division). Individual anti-tank guns produced some remarkable scores: one gun of the 75th Anti-Tank Regiment was able to hit six tanks with the first six rounds fired. In another position the battery watched as a line of German tanks moved side-on right across their front. When they opened fire few of their targets survived. The anti-tank gun fire was not all that the Germans had to face, for as they advanced they also moved directly into the pre-planned barrage of fire produced by no less than 172 field and medium guns that constituted the entire Corps artillery strength. This fire seriously affected the hapless German infantry, who attacked with their usual determined fervour but were able to dislodge the defenders at only one location, where a spirited counterattack threw them out.

But it was the anti-tank gun screen that caused the most damage. Without the support of the German tanks the infantry could do little unaided, despite the frantic attempts of the German artillery to back them up. The casualties of the tanks were high. In the first two hours no less than 50 of the main force of 141 Afrika Korps tanks that moved into the killing ground had been knocked out. Some of these were the much-vaunted Tigers. Their armour, as expected, was proof against the projectiles fired from the 6-pdr guns, but it was not proof against the fire from the 17/25-pdr weapons. The 17-lb solid projectiles were well able to penetrate even the frontal armour of the Tigers, and some tanks were knocked out. The 6-pdr guns also attempted to use a tactic that was later to become a standard practice, namely the manhandling of the guns round to the flank of a Tiger. There the 6-pdr gun had a chance of penetrating the Tiger's thick hide, but it was a risky procedure and at Medenine only a few of the more adventurous gun detachments attempted the ploy.

The German attack was decimated. The killing ground in front of the XXX Corps positions was a graveyard of German tanks, tanks that the Germans would be hard put to replace and which would be sorely missed during the forthcoming campaign in Tunisia itself.

The tank killing ground concept was used at Medenine for the first time on a large scale, and amply paved the way for its use on many subsequent occasions. It is still a standard anti-armour defensive measure and it will be used during any future conflict. The main change now is that anti-tank guns are unlikely to be used and their place will be taken by anti-tank missiles and other systems. The result will probably be the same, with catastrophic tank losses.



The German assault advanced into the killing ground, and at close range even the British 6-pdr anti-tank guns were devastating, accompanying German infantry being helpless due to the artillery barrage.

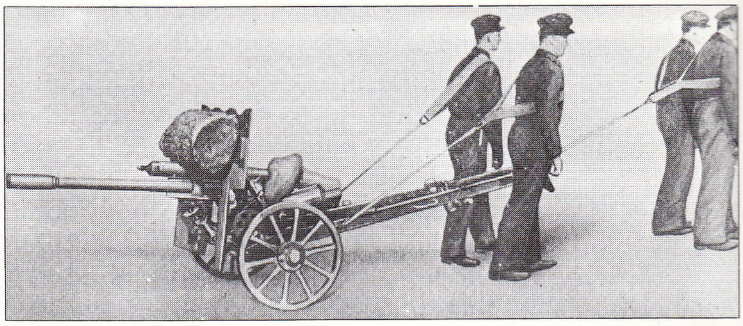
CZECHOSLOVAKIA

Skoda 47-mm kanon P.U.V. vz 36 anti-tank gun

The Czech firm of Skoda, based at Pilsen, was one of the first European armaments manufacturers to turn its attention to the production of specialized anti-tank guns. All through the 1920s Skoda's technicians and designers carried out a long chain of experiments and design studies to formulate a viable anti-tank gun, and in 1934 the company produced a gun with a calibre of 37 mm (1.46 in). For various reasons this weapon was not widely adopted (it was generally felt that something heavier would be needed) and in 1936 there appeared the **Skoda 47-mm kanon P.U.V. vz 36** (vz for *vzor*, or model). The vz 36 had a calibre of 47 mm (1.85 in) and was immediately ordered into production by the Czech army.

In its day the vz 36 was one of the most powerful and hardest-hitting of all the contemporary European anti-tank guns. It fired a relatively heavy projectile, weighing 1.65 kg (3.6 lb), and this projectile could penetrate any tank then in service at ranges of up to 640 m (700 yards) at a time when most similar guns were confined to targets no more than 185 to 275 m (200 to 300 yards) distant. But despite this power the vz 36 appeared a rather clumsy design. It had anachronistic spoked wheels and a very long trail which split to form two legs when in the firing position. The crew was protected by a shield that had over the wheels flaps that were folded out in action, but an oddity was that the upper rim of the shield was finished off as an asymmetric curved line to aid concealment, the wavy line breaking up the outline. The gun had a prominent recoil cylinder over the barrel and another recognition feature was the unusual single-baffle muzzle brake.

Production for the Czech army proceeded at a high priority, and a few guns were exported to Yugoslavia at one point. In service the vz 36 was issued to the specialist anti-tank companies of the Czech army, but was found to be a bit of a handful for the infantry anti-tank units, for whom a developed version of the earlier 37-mm (1.46-in) gun was placed in production. This became the **kanon P.U.V. vz 37**, and although this gun followed the same general lines as the larger 47-mm (1.85-in) model it was recognizable by the use of more modern steel wheels with rubber tyres.

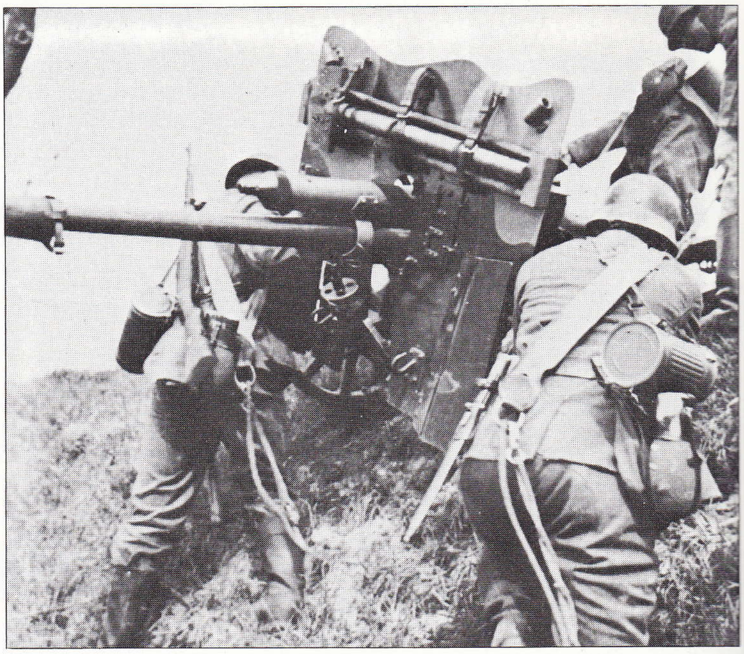


An illustration from the Skoda brochure that advertised their 47-mm (1.85 mm) Model 1936 anti-tank gun for possible sales outside Czechoslovakia. The gun is here being towed by the gun crew using drag ropes.

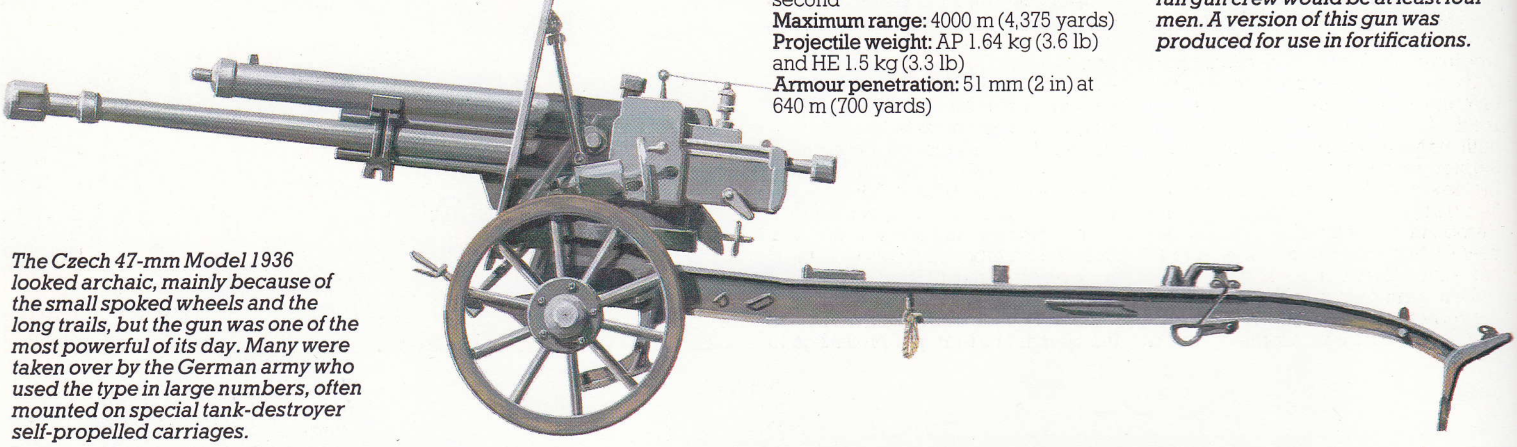
The vz 36 was destined never to fire a shot for its Czech masters, for the Munich Agreement of 1938 allowed the Germans to take over the Czech Sudetenland defences without a shot being fired. This allowed the Germans to impress large numbers of a very special version of the vz 36 that had been developed for use in static fortifications, but large numbers of the wheeled vz 36 fell into German hands during the following year when Germany took over control of the rest of Czechoslovakia. The vz 36 then became the **4.7-cm Pak 36(t)** and was eagerly added to the German gun parks. The Czech gun became a virtual standard weapon with the German army and remained in use with some of their second-line units until the end of the war in 1945. It was mounted on several types of tracked chassis to become the armament of several German Panzerjäger (tank hunters) and proved itself to be a very viable anti-armour weapon. The vz 37s did not remain in German service long after 1941.

Specification

Kanon P.U.V. vz 36
Calibre: 47 mm (1.85 in)
Length of barrel: 2.04 m (6 ft 8 in)
Weight: travelling 605 kg (1,334 lb) and in action 590 kg (1,300 lb)
Traverse: 50°
Elevation: −8° to +26°
Muzzle velocity: AP 775 m (2,543 ft) per second
Maximum range: 4000 m (4,375 yards)
Projectile weight: AP 1.64 kg (3.6 lb) and HE 1.5 kg (3.3 lb)
Armour penetration: 51 mm (2 in) at 640 m (700 yards)



German soldiers manhandle their 4.7-cm Pak 36(t) during training prior to the invasion of France in 1940. The soldiers are wearing drag-rope slings for towing the gun, and a full gun crew would be at least four men. A version of this gun was produced for use in fortifications.



The Czech 47-mm Model 1936 looked archaic, mainly because of the small spoked wheels and the long trails, but the gun was one of the most powerful of its day. Many were taken over by the German army who used the type in large numbers, often mounted on special tank-destroyer self-propelled carriages.

GERMANY

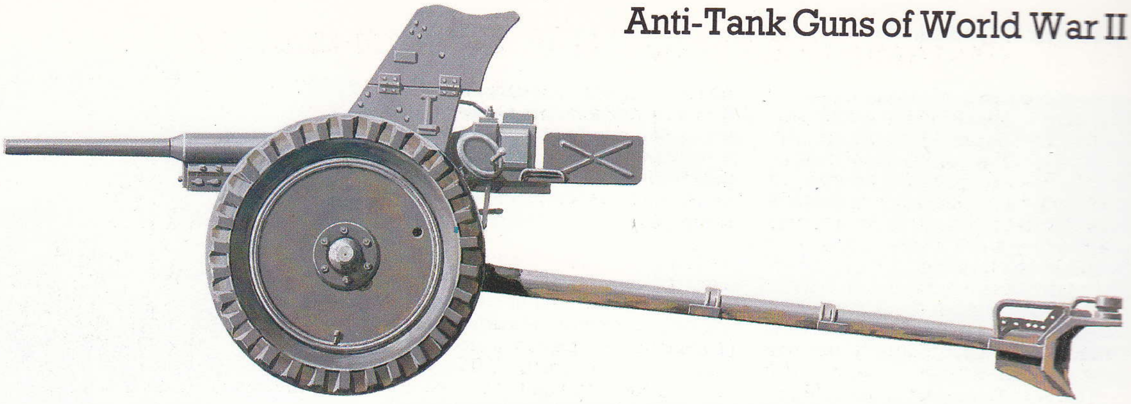
3.7-cm Pak 35/36

The origins of the gun that was to become the **3.7-cm Pak 35/36** (Pak for *Panzerabwehrkanone*, or anti-tank gun) can be traced back to 1925 when Rheinmetall began actively to design and develop an anti-tank gun for the German army. Production began in 1928, and as the German army was at that time still largely horse-oriented the gun was fitted with spoked wheels for horse traction. It was a very modern gun design for the period and used a well-sloped shield, tubular split-trail legs and a long slender barrel. At first production was relatively limited, but once the NSDAP came to power in 1933 production was greatly accelerated. In 1934 there appeared the first version with steel wheels and pneumatic tyres suitable for vehicle traction, and the designation **3.7-cm Pak 35/36** was assigned in 1936.

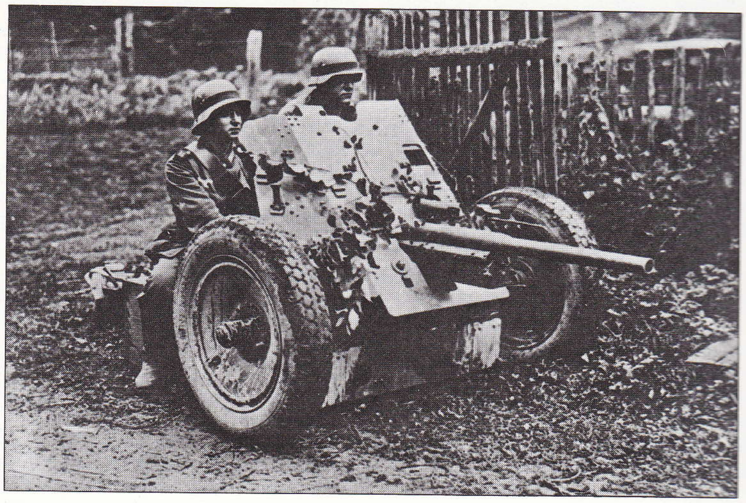
It was in 1936 that the Pak 35/36 first saw action, during the Spanish Civil War where the little gun proved eminently suited against the relatively light armoured vehicles used during the conflict. It also proved successful in 1939 against the lightly-armed Poles, but in 1940 the Pak gun crews encountered the more heavily armoured French and British tanks and had the unfortunate experience of seeing their carefully-aimed armour-piercing projectiles bouncing off the hulls of attacking tanks. The truth was that by 1940 the Pak 35/36 had had its day. It was no longer powerful enough to penetrate the armour of the more modern tanks, and larger calibre weapons had to take its place. But these latter could not be produced quickly enough to prevent the 37-mm (1.46-in) guns from having to be rushed to action during the German invasion of the Soviet Union (Operation 'Barbarossa') in 1941; against the T-34/76 tank they again proved to be of no use at all. Some attempts were made to prolong the service life of the gun by firing large stick bombs that fitted over the muzzle but these weapons, although effective, were essentially close-range missiles of dubious combat worth. Consequently the Pak 35/36 was passed to second-line and garrison units, and to some training schools, so the type was still in limited service in 1945. Many carriages were later converted to take 75-mm (2.95-in) barrels to convert them to infantry support guns.

The Pak 35/36 was widely exported before 1939, and the design was copied in Japan as the **Type 97**. Other recipient nations were Italy (**Cannone contracarro da 37/45**), the Netherlands (**37-mm Rheinmetall**) and the Soviet Union, where the Pak 35/36 was known as the **M30**, was widely copied and formed the basis for a whole family of 37-mm (1.46-in) and 45-mm (1.77-in) anti-tank guns that served on for many years after 1945 (some were still in service in Soviet-influenced nations as late as the 1970s). The design was also copied in the United States to produce the **Antitank Gun M3**, although only the concept was copied as the M3 had many detail differences from the German original.

At one point the Germans produced a special version of the Pak 35/36 for paradropping.



Above: The original 3.7-cm Pak 35/36 produced during the late 1920s had spoked wheels for horse traction, but by the mid-1930s these had been replaced by steel disc wheels for motor traction. It was a light and low gun that was at first issued to all arms of the Wehrmacht.



Right: The German 3.7-cm Pak 35/36, seen here on exercises prior to 1939. The Pak 35/36 was a Rheinmetall design produced during the 1920s; at the time it had a great influence on anti-tank gun design elsewhere.

Specification

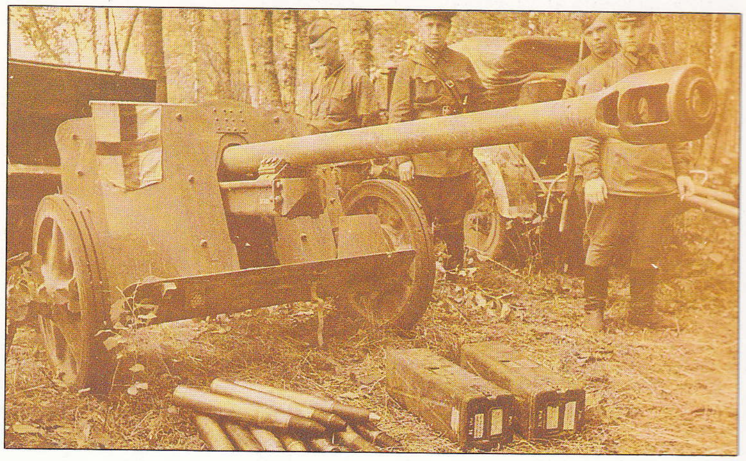
3.7-cm Pak 35/36
Calibre: 37 mm (1.46 in)
Length of gun: 1,665 m (5 ft 5.5 in)
Length of rifling: 1.308 m (4 ft 3.5in)
Weight: travelling 440 kg (970 lb) and in action 328 kg (723 lb)
Traverse: 59°
Elevation: −8° to +25°
Muzzle velocity: AP 760 m (2,495 ft) per second
Maximum range: 7000 m (7,655 yards)
Projectile weight: AP 0.354 kg (0.78 lb) or HE 0.625 kg (1.38 lb)
Armour penetration: 38 mm (1.48 in) at 30° at 365 m (400 yards)

GERMANY

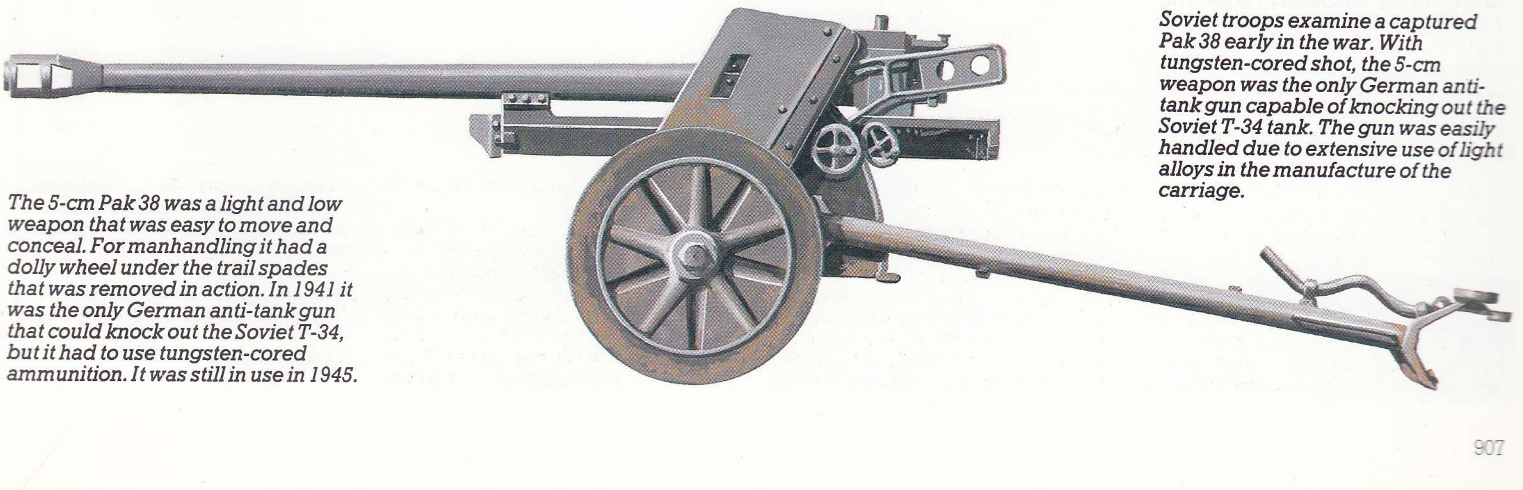
5-cm Pak 38

It has been mentioned in the entry relating to the 3.7-cm Pak 35/36 that by 1940 the 37-mm anti-tank gun was of very limited value against the armour of tanks then in service. Fortunately for the German army this had been foreseen as early as 1937, and by 1938 Rheinmetall-Börsig had developed and produced a new gun with a calibre of 50 mm (1.97 in). By 1939 the gun was ready for production, but it was not until mid-summer 1940 that the first examples reached the troops. By then the new gun, designated the **5-cm Pak 38**, was too late to take much part in any European campaign and it was not until 1941 that the new gun was able to see action during a major campaign.

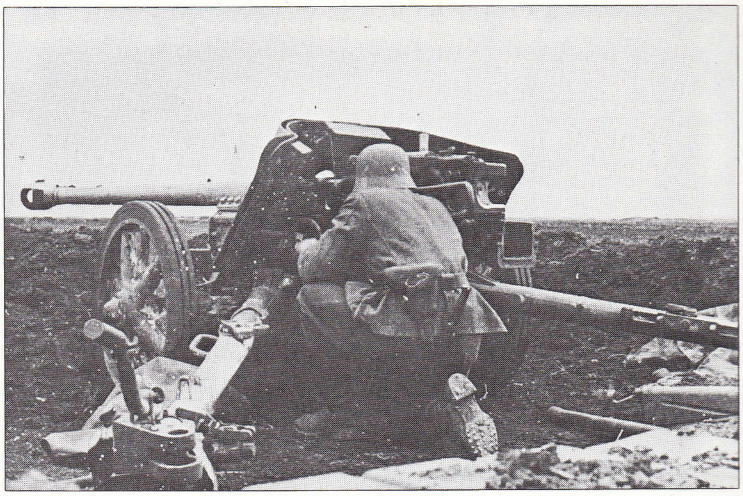
That campaign was the invasion of the Soviet Union, and by that time the new gun had been supplied with a new type of tungsten-cored ammunition known as AP40. This ammunition was developed from captured Czech and Polish ammunition, and was adopted because the dense tungsten core of the new projectiles offered a considerable increase in armour penetration. This was just as well, for when the Soviet T-34/76 appeared on the battlefields the Pak 38 firing AP40 ammunition proved to be the only gun/projectile combination capable of penetrating the Soviet tank's thick hide. But the numbers of Pak 38s in the field were limited, the gun could not be everywhere and it was some time before extemporized conversions of old French 75-mm (2.95-in) guns could be hurried up to fill the many gaps in the anti-tank defence lines. After that the 50-mm (1.97-in) gun proved good



Soviet troops examine a captured Pak 38 early in the war. With tungsten-cored shot, the 5-cm weapon was the only German anti-tank gun capable of knocking out the Soviet T-34 tank. The gun was easily handled due to extensive use of light alloys in the manufacture of the carriage.



The 5-cm Pak 38 was a light and low weapon that was easy to move and conceal. For manhandling it had a dolly wheel under the trail spades that was removed in action. In 1941 it was the only German anti-tank gun that could knock out the Soviet T-34, but it had to use tungsten-cored ammunition. It was still in use in 1945.



Awaiting a Soviet tank assault, the dug-in Pak 38 presented a very small target. Superseded in production by the larger Pak 40 of 7.5-cm calibre, the Pak 38 remained in Wehrmacht service until the end of the war, remaining reasonably effective.

enough to remain in use for the rest of the war, although it was largely replaced by heavier-calibre weapons.

The Pak 38 was a well-designed gun with a curved shield, steel wheels and a tubular split-trail carriage that locked out the torsion bar suspension when the trail legs were spread. Light alloys were used throughout the construction of the carriage, which made it easy to handle, and a small dolly wheel was mounted under the trail legs for man-handling. The long barrel was fitted with a muzzle brake.

The Pak 38 was one of the German army's standard anti-tank guns and was further developed at one stage to take an automatic ammunition feed. This enabled it to be used as a heavy aircraft weapon, and at one point this was fitted to a variant of the Messerschmitt Me 262 jet fighter. Later this same weapon was further adapted to be used as a ground-mounted anti-aircraft gun but that was late in the war and none appear actually to have been produced. There was also a tank gun equivalent of the Pak 38 that was produced in a number of models, so many in fact that large numbers ended up as beach defence guns in the Atlantic Wall. The Pak 38 was also mounted on a number of tracked Panzerjäger carriages. At one point so many had been captured by the British army that they were reconditioned and stockpiled against some future contingency that never arose.

Specification

5-cm Pak 38
Calibre: 50 mm (1.97 in)
Length of piece: 3.187 m (10 ft 5.5 in)
Length of rifling: 2.381 m (7 ft 9.7 in)
Weight: travelling 1062 kg (2,341 lb) and in action 1000 kg (2,205 lb)
Traverse: 65°
Elevation: −8° to +27°
Muzzle velocity: AP 835 m (2,903 ft) per second, AP40 1180 m (3,870 ft) per second and HE 550 m (1,805 ft) per second
Maximum range: HE 2650 m (2,900 yards)
Projectile weight: AP 2.06 kg (4.54 lb), AP40 0.925 kg (2.04 lb) and HE 1.82 kg (4 lb)
Armour penetration: AP40 101 mm (3.98 m) at 740 m (820 yards)

GERMANY

7.5-cm Pak 40

By 1939 intimations regarding the next generation of Soviet tanks were filtering back to the German war planner staffs in Berlin. Although the new 50-mm (1.97-in) Pak 38 gun had yet to reach the troops, it was felt that something heavier was going to be needed to counter the armour belts of the new Soviet tanks, and consequently Rheinmetall-Borsig was asked to produce a new design. In basic terms what Rheinmetall did was to scale up the Pak 38 design to the larger calibre of 75 mm (2.95 in). The result was adopted in 1940 as the **7.5-cm Pak 40**, but it was not until late in the following year that the first examples reached the hard-pressed troops on the Eastern Front.

In appearance the Pak 40 resembled its predecessor, but there were many differences apart from the scale. The basic layout of the 50-mm (1.97-in) gun was retained but this time the expected shortages of many raw materials and especially light alloys (which had been earmarked for the Luftwaffe production requirements) were becoming apparent, so the Pak 40 was constructed mainly from various forms of steel and was proportionately much heavier than the smaller gun. To simplify and speed production the shield was formed from flat instead of curved plates, and there were several other such alterations. The result was an excellent gun, well capable of tackling virtually any Allied tank and encountered on all fronts.

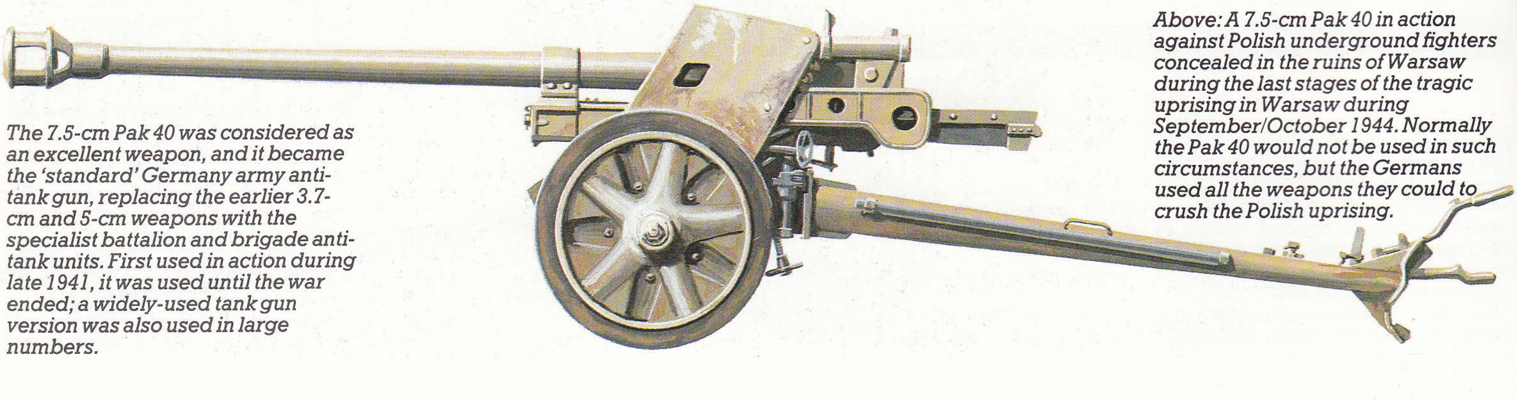
The Pak 40 was destined to remain in production until the end of the war in 1945. It had a tank gun equivalent that was progressively developed, but the Pak 40 itself remained in service virtually unchanged. A version intended for use as an aircraft weapon was developed, and the carriage was even adapted at one stage to allow short 75-mm (2.95-in) barrels to be fitted to produce a form of infantry/anti-tank gun for use by infantry formations. The gun itself was even placed on a 105-mm (4.14-in) howitzer carriage to form a light field artillery piece, though another approach was to use the Pak 40 itself as a field gun, and by 1945 there were several artillery formations using this gun as the **7.5-cm FK 40** (FK for *Feldkanone*, or field gun).

But it was as an anti-tank gun that the Pak 40 was most important. Many German gunners rated it their best all-round weapon, and many Allied tank crews had occasion to agree with them. The Pak 40 fired a wide range of ammunition, varying from the straightforward solid armour-piercing shot to the tungsten-cored AP40. Also available were high explosive shells that carried enough payload to make the type a useful field artillery piece, and various forms of hollow-charge projectile. A measure of the efficiency of this gun can be seen in the range/armour penetration figure that at 2000 m (2,190 yards) an AP40 projectile could penetrate no less than 98 mm (3.86 in) of armour plate; and at combat range of the order of 500 m (550 yards) this figure increased to 154 mm (6.06 in).

Specification

7.5 cm Pak 40
Calibre: 75 mm (2.95 in)
Length of piece: 3.7 m (12 ft 1.7 in)
Length of rifling: 2.461 m (8 ft)
Weight: travelling 1500 kg(3,307 lb) and in action 1425 kg (3,141.5 lb)
Traverse: 45°
Elevation: −5° to +22°
Muzzle velocity: AP 750 m (2,460 ft) per second, AP40 930 m (3,050 ft) per second and HE 550 m (1,805 ft) per second
Maximum range: HE 7680 m (8,400 yards)
Projectile weight: AP 6.8 kg (15 lb), AP40 4.1 kg (9.04 lb) and HE 5.74 kg (12.65 lb)
Armour penetration: 98 mm (3.86 in) at 2000 m (2,190 yards)

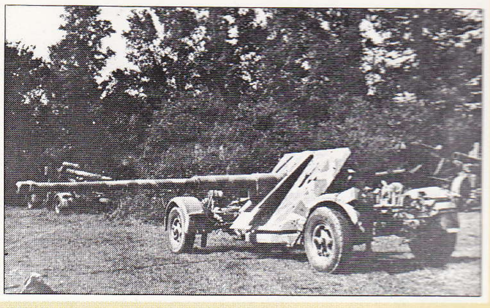
Above: A 7.5-cm Pak 40 in action against Polish underground fighters concealed in the ruins of Warsaw during the last stages of the tragic uprising in Warsaw during September/October 1944. Normally the Pak 40 would not be used in such circumstances, but the Germans used all the weapons they could to crush the Polish uprising.



The 7.5-cm Pak 40 was considered as an excellent weapon, and it became the 'standard' Germany army anti-tank gun, replacing the earlier 3.7-cm and 5-cm weapons with the specialist battalion and brigade anti-tank units. First used in action during late 1941, it was used until the war ended; a widely-used tank gun version was also used in large numbers.

'88' in Action

An M4 Sherman makes its way carefully through the Normandy hedgerows in 1944. No enemy is in sight, yet nearly two kilometres away experienced eyes are looking through a sighting device. Seconds later one of the most feared weapons of World War II has claimed another victim.



The low profile and powerful gun of the 8.8-cm Pak 43 are apparent in this photograph. This specialist anti-tank '88' was probably the finest weapon of its kind produced in World War II.

One of the oddest facts relating to anti-tank guns in service during World War II is that the most famous such weapon was not an anti-tank gun at all but an anti-aircraft gun. This was the famous (or infamous) '88', the gun that could knock out any tank it could see at ranges well outside those of normal anti-tank guns. The weapon gained for itself a reputation that in some ways overshadowed the disadvantages of the gun, but the fact was that the '88' was used as an anti-tank gun on the very day World War II started and it was still knocking out tanks when the war ended.

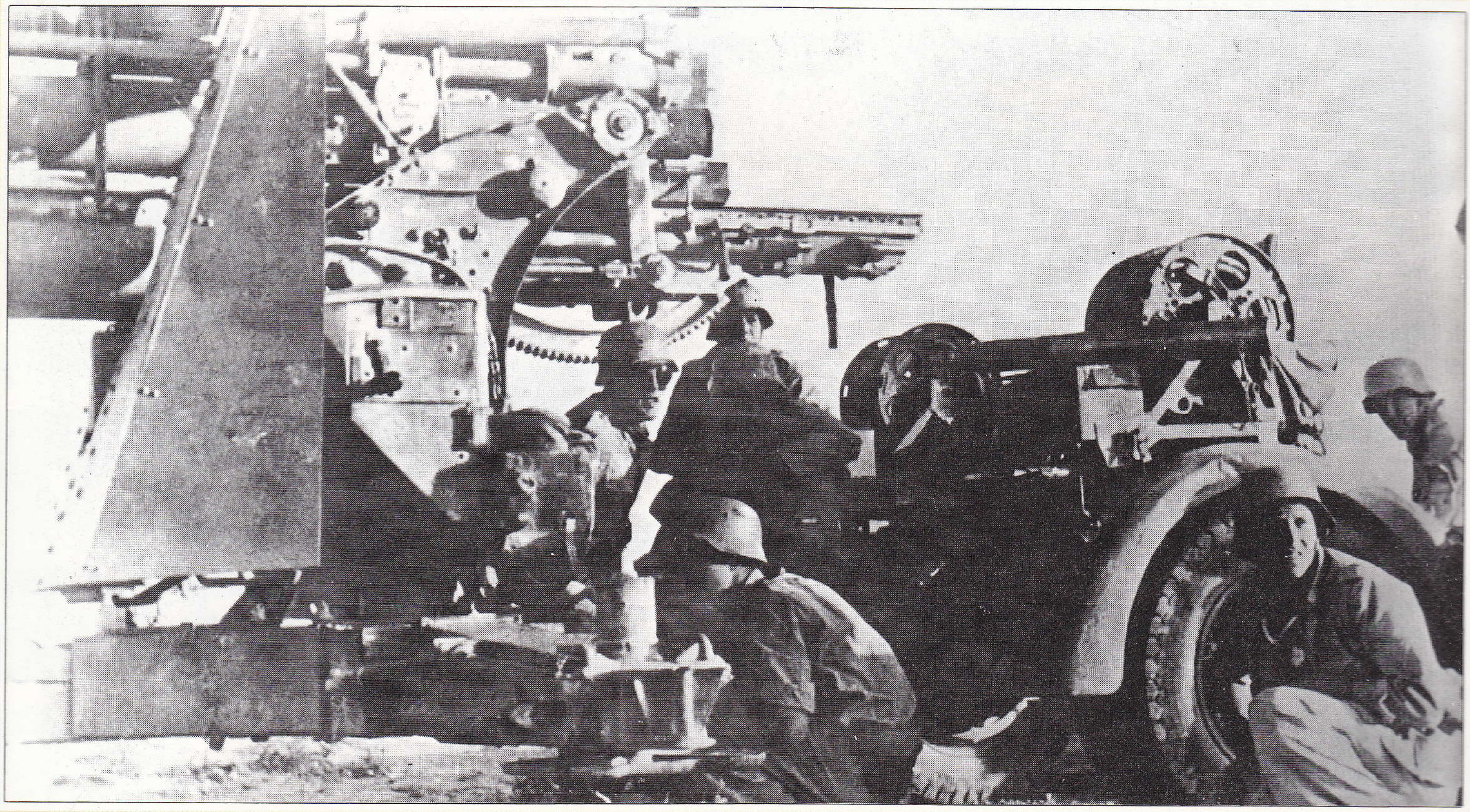
The weapon was designed and developed as an anti-aircraft gun, the actual design and development of the gun being carried out not in Germany but in Sweden during the 1920s when gun designing was forbidden to Krupp by the terms of the Treaty of Versailles. Krupp got around this by setting up a design team based in Sweden but funded by the German army. By 1932 they had produced an excellent anti-aircraft gun carried between two bogie axle units and pivot-mounted on a cruciform carriage when emplaced. The barrel was long and slender and it had a high muzzle velocity between 820 and 840 m (2,690 and 2,755 ft) per second. The projectile weighed 9.6 kg (21.16 lb) and the maximum ceiling to which this projectile could be fired was 10600 m (34,775 ft). For the period this performance was little short of excellent, and when the new German army started to re-arm during 1933 numbers of '88s' were already coming from the Krupp production lines at Essen.

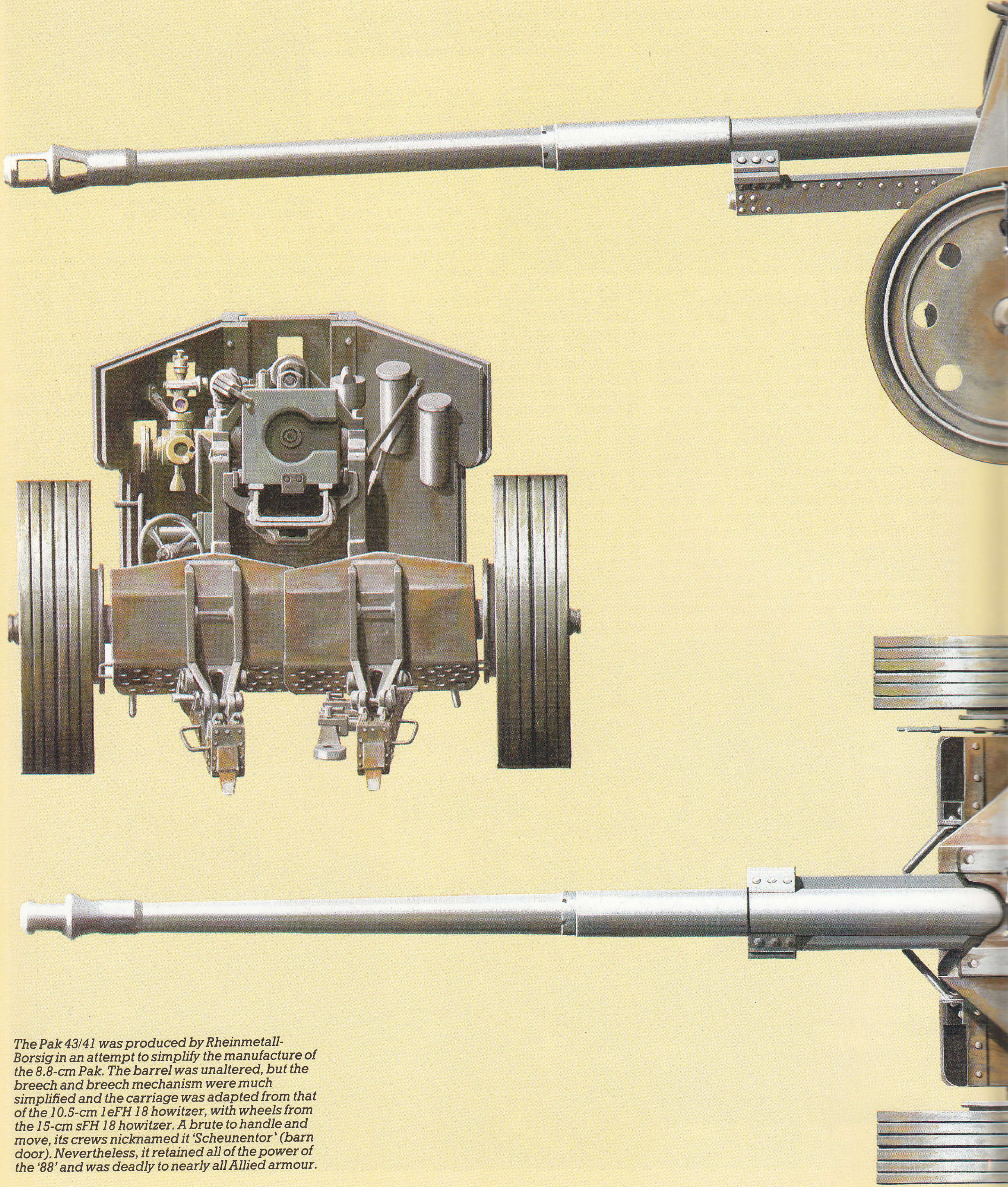
The '88' was known to the Germans as the 8.8-cm Flak 18 (Flak being the abbreviation of Fliegerabwehrkanone, or anti-aircraft gun) and it was issued both to the army and to the emergent Luftwaffe as the defence of Germany against air attack was deemed to be a matter for the Luftwaffe. The army guns went to anti-aircraft battalions under direct army control. As such they were intended for the protection of field units against air attack, and initially they were used only in this role. But that changed at some point during the Spanish Civil War that raged from 1936 to 1939.

The exact point at which the '88' made the transition from anti-aircraft gun to anti-tank gun is now shrouded in mystery but it probably took place during the fighting that went on around Madrid for much of the war. On the Republican side large numbers of tanks were supplied from various sources, while on the Nationalist side there was the direct intervention of German and Italian contingents armed with the appropriate weapons. This included '88s' on the German side, and at some point a tank attack was countered by the simple expedient of lowering the barrel of one or more of the '88' guns emplaced for anti-aircraft use to fire directly at the attacking armour. The results must have been spectacular, for the tanks of the day were only lightly armoured, and the impact of an '88' projectile would have been devastating. This should not have been surprising, for the combination of a heavy projectile and a high muzzle velocity provided the '88' with an excellent anti-armour performance at hitherto unimaginable ranges. Experience soon showed that tanks could be knocked out by the '88' at ranges of over 2000 m (2,190 yards). This was not all, for the '88' also demonstrated that it was equally useful as a device for knocking out battlefield emplacements and bunkers, the high explosive projectile intended for use against aircraft being equally effective against structures.

These facts were duly noted by the German war planners, and thus the '88' became a dual-purpose weapon, and part and parcel of the German army's tactical repertoire. Outside Spain few other military observers took note of the fact, so during the invasion of Poland in September 1939 the '88' took the unfortunate Poles completely by surprise: they learned the hard way that their tanks were vulnerable at

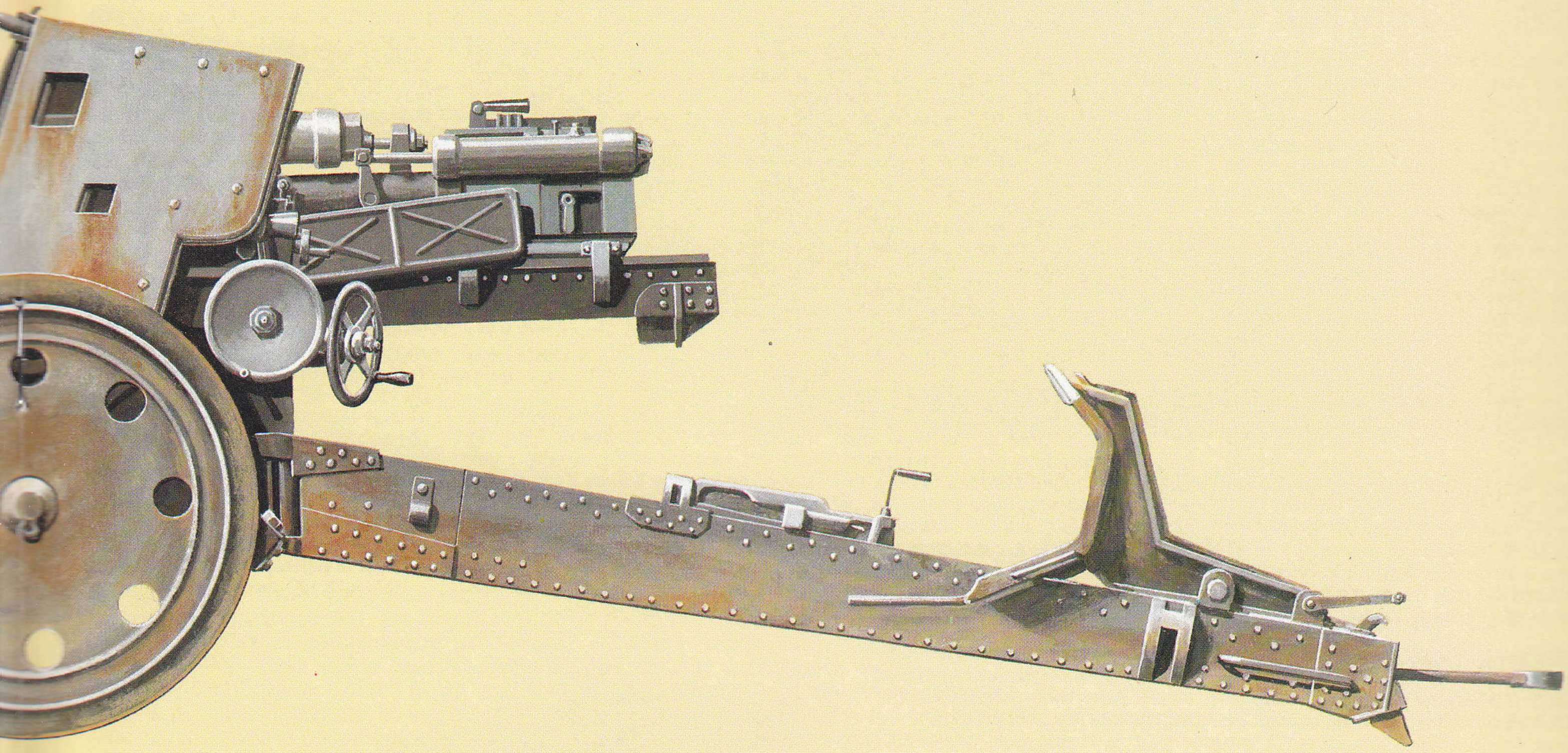
The wide open spaces of the Western Desert proved a profitable hunting ground for the dual-purpose '88'. Crouched by their weapon, an Afrika Korps gun crew prepare for combat, engaging at a distance well outside the range of the guns mounted on any Allied tank.

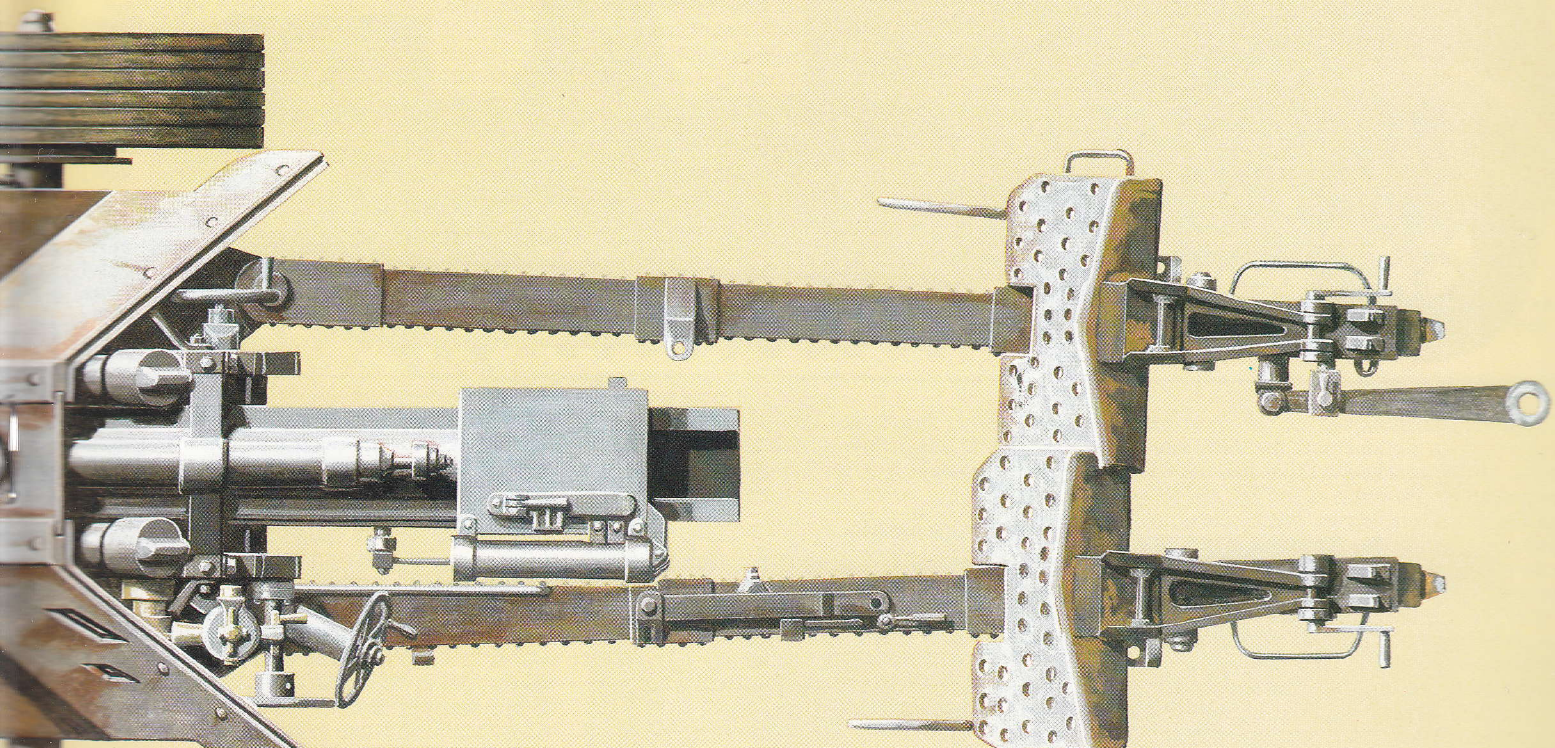




The Pak 43/41 was produced by Rheinmetall-Borsig in an attempt to simplify the manufacture of the 8.8-cm Pak. The barrel was unaltered, but the breech and breech mechanism were much simplified and the carriage was adapted from that of the 10.5-cm leFH 18 howitzer, with wheels from the 15-cm sFH 18 howitzer. A brute to handle and move, its crews nicknamed it 'Scheunentor' (barn door). Nevertheless, it retained all of the power of the '88' and was deadly to nearly all Allied armour.

8.8-cm Pak 43/41 'Scheunentor'





GERMANY

8.8 cm Pak 43 and 8.8 cm Pak 43/41

The success of the 8.8-cm Flak 18 (Flak for *Fliegerabwehrkanone*, or anti-aircraft gun) as an anti-tank weapon led to the development of a similar weapon for use as a tank gun to arm the large Tiger tank. Further design thought ran along the lines of developing a comparable family of guns for tank, anti-tank and anti-aircraft use. From this came a series of design studies known as the Gerät 42 (*Gerät* was the designation for equipments still in the design stage), but in the event the anti-aircraft gun specification was pitched at a level where the 88-mm (3.45-in) calibre could not cope and thus the designers concentrated on the tank and anti-tank guns.

Krupp was given the eventual production contract for the new anti-tank gun, and in 1943 produced the **8.8-cm Pak 43**. This was a truly superb gun, but it was also a fairly large one. To move it required a powerful tractor and a large gun team, and once emplaced the gun was removed from its twin-axle carriage to rest upon a large cruciform carriage. It thus lacked the mobility of the smaller anti-tank guns but could knock out virtually any tank likely to enter its sights, even at ranges of over 2500 m (2,735 yards). The Pak 43 bristled with advanced features such as a semi-automatic breech mechanism, an electrical firing circuit with safety cut-outs to prevent firing over unsafe arcs, and a low turntable carriage. It was also difficult to produce in quantity, a factor not helped by the continuous attention given to the various Krupp factories by the Allied bomber fleets, so output was constantly disrupted.

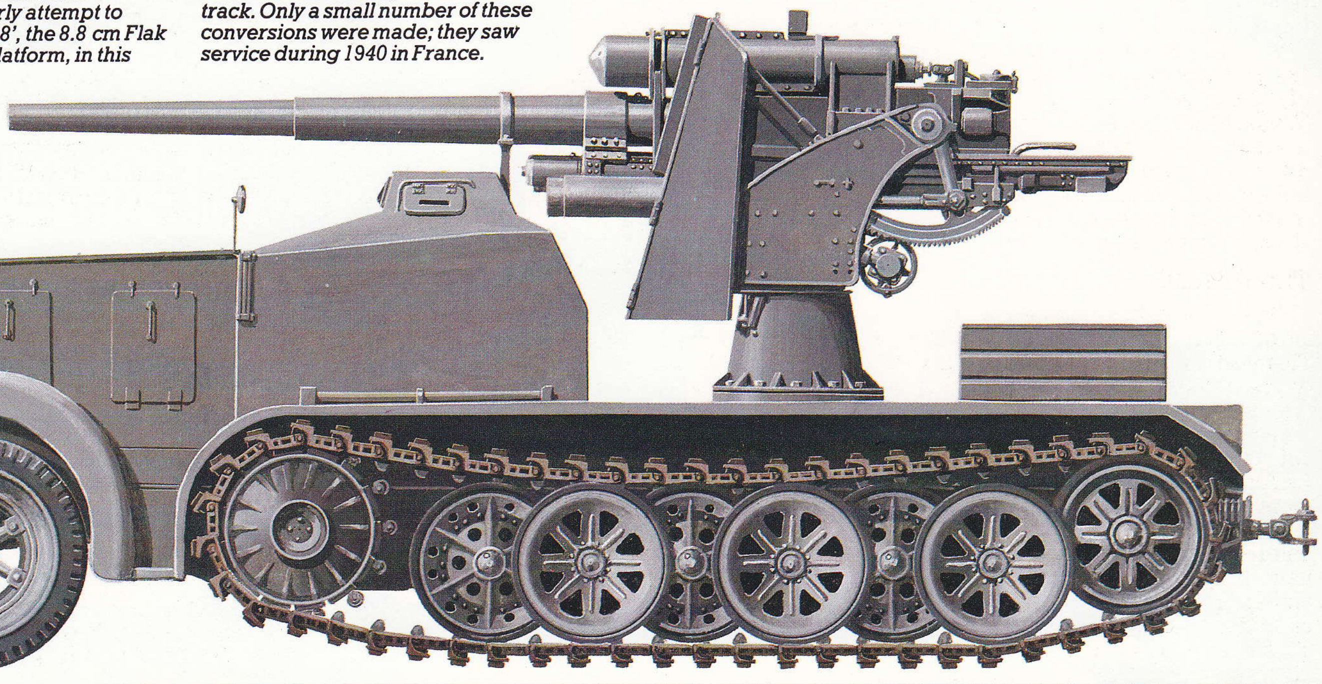
When the Pak 43 appeared in service, commanders on all fronts called for more and more of the type and demand consistently outstripped supply. In typical German fashion an extemporized way was found out of this situation by asking Rheinmetall-Borsig to produce its own version from existing resources. The result was the **8.8-cm Pak 43/41**, a hotchpotch of various weapons cobbled together to provide the required gun. The basic ordnance of the Pak 43 was retained, but in this instance placed on a new single-axle carriage with a conventional split trail. The carriage came from one gun, the wheels from another and other bits and pieces from other sources. A new shield was produced and the result was a most cumbersome and ungainly design that had one saving grace, the fact that it worked. For despite being a brute to handle and emplace, the gun retained the power of the original Pak 43. Thus it was tolerated but never gained the respect and praise bestowed upon the superb Pak 43.

By 1945 both guns were still in production. The Pak 43 was modified for use on various self-propelled carriages and as the **8.8-cm KwK 43** tank gun was the main armament of the powerful Tiger II tank. The ammunition fired by these weapons was different from the 88-mm (3.46-in) ammunition fired by the earlier anti-aircraft guns that were the origins of the '43' family, and used a more powerful propellant system. This ammunition was considered suitable for use in the field artillery role and despite the desperate need for anti-tank guns on all fronts by 1945 many of these guns were used by field artillery batteries.

Specification

8.8-cm Pak 43
Calibre: 88 mm (3.45 in)
Length of piece: 6.61 m (21 ft 8 in)
Length of rifling: 5.125 m (16 ft 9.8 in)
Weight: travelling 4750 kg (10,472 lb) and in action 3650 kg (8,047 lb)
Traverse: 360°
Elevation: −8° to +40°
Muzzle velocity: AP 1130 m (3,707 ft) per second, and HE 950 m (3,118 ft) per second
Maximum range: HE 15150 m (16,570 yards)
Projectile weight: AP 10.16 or 7.3 kg (22.4 or 16.1 lb), and HE 9.4 kg (20.7 lb)
Armour penetration: 184 mm (7.244 in) at 2000 m (2,190 yards)

This self-propelled anti-tank carriage was an early attempt to place the famous '88', the 8.8 cm Flak 18, onto a mobile platform, in this case a 12-ton artillery tractor half-track. Only a small number of these conversions were made; they saw service during 1940 in France.



ranges hitherto thought safe. The short duration of the war in Poland and the overwhelming defeat of the unfortunate Poles had the effect of disguising the new role of the '88', so that when the Germans advanced into France in May 1940 the effect of the '88' came again as a definite shock, this time to the French and British armies.

The '88' was used as a bunker-buster during the short approach to the River Meuse through the Ardennes, and during the crossing of the Meuse more were used to cover the risky crossings. But it was left until the British armoured counterattack around Arras for the point to be rammed home that the Germans had a weapon that could defeat even the heavy armour of the Matilda infantry tanks. The crews of these tanks suffered terribly as the heavy projectiles smashed their way into the interiors before exploding, destroying both the tank and the crew, and this British suffering continued once the '88' was taken to North Africa with the Afrika Korps.

The Afrika Korps

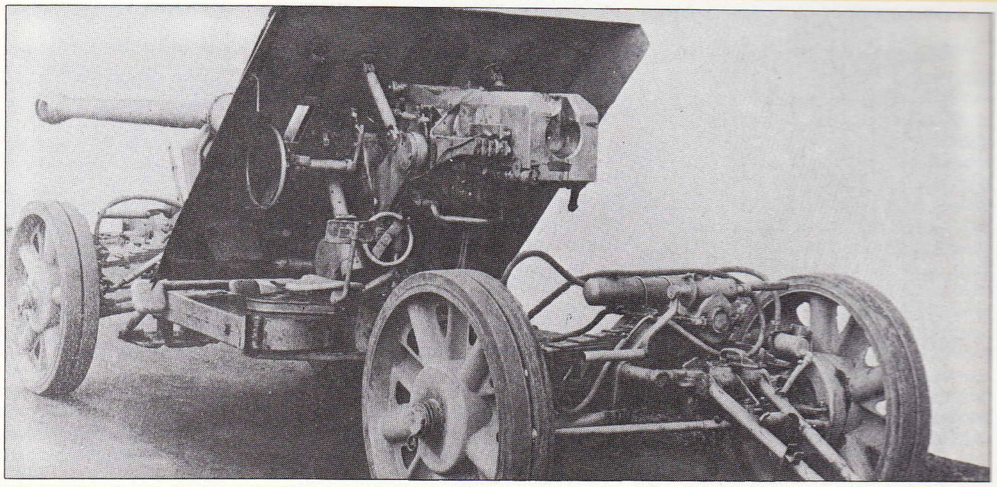
In the wide expanses of the North African desert the '88' could reign truly supreme. Much of the time tank targets could be spotted over considerable range, but the first intimation that an '88' was in the vicinity came when an Allied tank exploded. The speed at which the incoming projectile travelled was such that it impacted before the sound of the gun firing could be heard, and the use of delayed-action fuses meant that the shells exploded only after they had penetrated the tank armour. Under these conditions the '88' became a highly feared weapon, but its effect was often enhanced by what can now be seen as incorrect Allied tactics. All too often British and Commonwealth tanks simply charged at points heavily defended by the Germans, with the result that they were picked off by the emplaced '88s'. On more than one occasion the '88s' were instrumental in breaking up tank attacks even before they began.

Despite all this power and effectiveness, it has to be admitted that the '88' was not a perfect anti-tank weapon: it was very bulky, and it was slow to get in and out of action. It was possible to fire the gun directly from its wheeled carriage, but for full use to be made of the gun, it had to be emplaced on the cruciform carriage. This meant lowering it from the two-wheeled bogie units, a time-consuming business. Moreover, to enable the '88' to be used in the anti-tank role much of the anti-aircraft fire control instrumentation had either to be removed or rendered useless, which limited the utility of the gun and diverted it from its intended purpose. A shield could be added to provide the crew with some measure of protection but this was often not used so the crew was vulnerable to incoming fire, which was used by the Allies as a means to counter the weapon. If possible the area around the gun was saturated with artillery fire.

By the time the Germans invaded the Soviet Union in 1941 the '88' was well established as an anti-tank gun, which was just as well, for the '88' was the only gun to hand (other than the 5-cm Pak 38 firing special AP40 ammunition) that could tackle the Soviet T-34/76 tank. Special anti-armour projectiles had been developed for the '88', including an armour-piercing shot that could penetrate 100 mm (3.94 in) of armour at 1830 m (2,000 yards). By 1941 the 8.8-cm Flak 18 had been joined in service by two further versions, the 8.8-cm Flak 36 and 8.8-cm Flak 37. These two guns differed from one another in details such as the fire-control systems and changes to the carriages, but many items were interchangeable between them and the earlier 8.8-cm Flak 18. These three guns remained in service throughout the war, the 8.8-cm Flak 36 and 8.8-cm Flak 37 remaining in production right until 1945. They had to bear the brunt of the anti-aircraft defence of the Reich, and also of the army units in the field, so there gradually grew up what was to become a constant source of squabbling between the various user arms. The Luftwaffe demanded more and more guns to defend the Reich, and the army wanted more and more for its dual-purpose gun requirements. It was a squabble that was never resolved to anyone's satisfaction despite various efforts to get new models into the field.

The '88' family

One of the earliest of these measures was the introduction of a new '88', the 8.8 cm Flak 41. This was an entirely new gun designed and developed by Rheinmetall-Borsig, but despite the facts that it had excellent all-round performance and fired an entirely new range of ammunition, it had too many technical faults (which proved to be inherent) and the bulk of those produced were assigned to anti-aircraft defences only. Shortly after the 8.8-cm Flak 41 entered service Krupp was asked to develop a new design of gun that could be used as an anti-aircraft, anti-tank and tank gun. Krupp assigned the new design the cover name Gerät 42. Almost as soon as development of this new family of guns got under way the planners decided to increase the specifications demanded from the anti-aircraft gun, and Krupp promptly withdrew from that contest (the gun was never developed by anyone else) but instead went ahead with the anti-tank and tank guns. The anti-tank gun emerged as the 8.8-cm Pak 43. This gun owed nothing to the earlier anti-aircraft guns and fired an entirely new range of ammunition. It retained the two-wheeled bogie units and the cruciform layout for the carriage, but the gun was mounted low down on a 360° turntable and was protected by a well-sloped shield. The Pak 43 turned out to be one of the best anti-tanks produced anywhere during World War II and had a remarkable performance that surpassed even that of the Flak guns. The main problem for the Germans was that they could not produce enough of them. Almost as soon as it got under way, production at Essen was disrupted by Allied air raids and more time was lost as the production facilities were established elsewhere. Also the gun was rather demanding of materials and facilities to the point where an alternative was sought. The alternative was found in the shape of the 8.8-cm Pak 43/41, one of the unloveliest of weapons but one which was every bit as powerful as the Pak 43. Rheinmetall-Borsig copied the Pak 43 barrel virtually unchanged, but added to it a simplified breech and breech mechanism. The main carriage came from the 10.5-cm leFH 18 field howitzer, and the wheels came from the 15-cm sFH 18, another field howitzer. Other bits and pieces were taken from here and there, and the cobbled-together result looked most odd. But it worked with all the power of the Pak 43 and the result was rushed into production to augment the other '88s' already in the field. It was a brute to handle and to move, and the gun crews involved gave it the nickname *Scheunentor* (barn-door).



The German 8.8 cm Pak 43 on its carriage. At the 1000-m (1094-yard) plus range favoured, it was capable of knocking out virtually any Allied tank. However, demand constantly outstripped supply – much to the relief of Allied tank crews.

Not all the '88s' were towed. The original '88' was developed into a tank gun, the 8.8-cm KwK 36, and this was mounted in the Tiger tank. The 8.8-cm Pak 43 also had a tank counterpart, the 8.8-cm KwK 43 fitted to the massive Tiger II. These were not the only mobile versions, for early on in the life of the 8.8-cm Flak 18 attempts were made to convert the guns for the self-propelled role. One of the earliest of these involved the use of a wheeled bus chassis, but by 1940 the '88' was carried into action in France mounted on half-tracked chassis (heavy half-tracks were also used to tow '88s'). But with the introduction of the 8.8-cm Pak 43 numerous tracked chassis were converted to carry the gun in a self-propelled role. One of the earliest of these was the Elefant, which proved to be a spectacular failure during the Battle of Kursk in 1943. Later vehicles were more successful, while others never passed the project stage. One of the best of the self-propelled '88s' was the Jagdpanther, which mounted a special version of the 8.8-cm Pak 43 in a well-sloped superstructure built onto the chassis of a Panther tank. This combination was by far the best all-round tank destroyer design of World War II and would still be a useful weapon today.

Mention must also be made of the '88' as a railway gun. Although in this role the '88' was used only for anti-aircraft work, large numbers were used on special trains that were pulled around the Reich to defend areas affected by Allied air attacks.

By 1945 the '88' had lost a lot of its earlier reputation as a wonder-gun, but it could still destroy tanks. It was this reputation that has now passed into virtual legend and the '88' will always be regarded as one of the most notable of all the guns that took part in World War II.

Late summer 1944, somewhere in north-east Europe: advancing British infantry take cover near a concealed 8.8 cm Pak 43 while a British 17-pdr stands ready in the background.

Taper-bore anti-tank guns

The German taper-bore guns were an odd off-shoot from the main avenue of anti-tank development that, although successful, foundered for the simple fact that the German war economy could not afford the raw materials required to produce them. Three guns were produced and issued for service, and all relied on what is commonly known as the Gerlich principle. In simple terms this involved the use of a small projectile core made from tungsten, a hard and very dense metal ideal for punching a way through armour plating. In order to provide this tungsten core with the maximum punch the Gerlich system involved the use of guns with calibres that tapered downwards in size from the breech to the muzzle. The special projectiles involved used flanged or 'skirted' forms that allowed the flanges to fold back as the bore narrowed. This had the advantage of increasing the emergent velocity of the projectile, enabling it to travel farther and to hit the target harder. The principle was attractive to the German ordnance designers who adapted it for the anti-tank gun, but the principle had some disadvantages: to ensure the maximum power of the gun expensive and relatively rare tungsten had to be used for the projectile core, and the guns themselves were costly to produce.

The first of the taper-bore guns to enter service was the **2.8-cm schwere Panzerbüchse 41 (2.8-cm sPzB 41)**, which was really little more than a heavy anti-tank rifle, with a bore that tapered from 28 mm (1.1 in) at the breech to 20 mm (0.787 in) at the muzzle. It used a light carriage, but an even lighter version of the carriage was produced for the German airborne formations. Both types were still in use at the end of the war.

Second of the taper-bore guns was the **4.2-cm leichte Panzerabwehrkanone 41 (4.2-cm lePak 41**, or light anti-tank gun 41). This used the carriage of the 3.7-cm Pak 35/36 but the ordnance was tapered from 40.3 mm (1.586 mm) at the start to 29.4 mm (1.157 in) at the muzzle. These guns were issued to German airborne units.

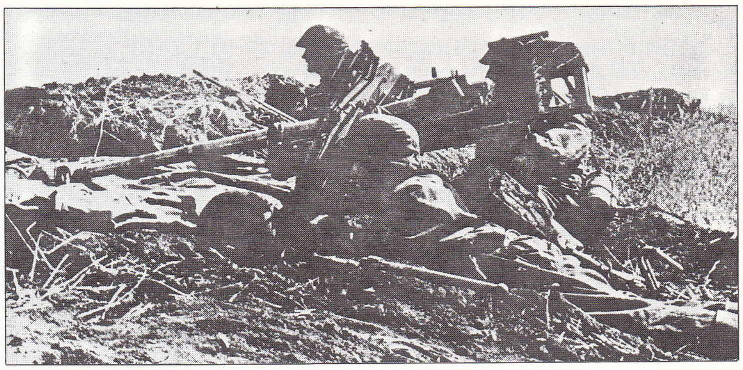
Largest of the trio was the **7.5-cm Pak 41**. This was a very powerful and advanced gun in which the bore decreased from 75 mm (2.95 in) to 55 mm (2.16 in). At one time this gun showed so much promise that it almost took over from the 7.5-cm Pak 40 as the standard German anti-tank gun, but despite having a better armour-piercing performance it was passed over because of the German tungsten shortage. Tungsten was normally used for the machine tools to produce more weapons, but the raw materials had to be brought into Germany by blockade runners and when these were repeatedly intercepted on the high seas the supplies dwindled. It was a choice between anti-tank guns and machine tools, and the result had to be the machine tools. Thus production of the taper-bore guns ceased. Only 150 Pak 41s were made, and once their ammunition had been expended they passed from use. The same applied to the other two guns, though the sPzB 41 was still in use in 1945 as its small projectiles made few demands on available stocks.

Specification

2.8-cm sPzB 41
Starting calibre: 28 mm (1.1 in)
Emergent calibre: 20 mm (0.787 in)
Length of barrel: 1.7 m (5 ft 7 in)
Weight: in action 223 kg (492 lb)
Traverse: 90°
Elevation: −5° to +45°
Muzzle velocity: AP 1400 m (4,593 ft) per second
Projectile weight: AP 0.124 kg (0.27 lb)
Armour penetration: 56 mm (2.205 in) at 365 m (400 yards)

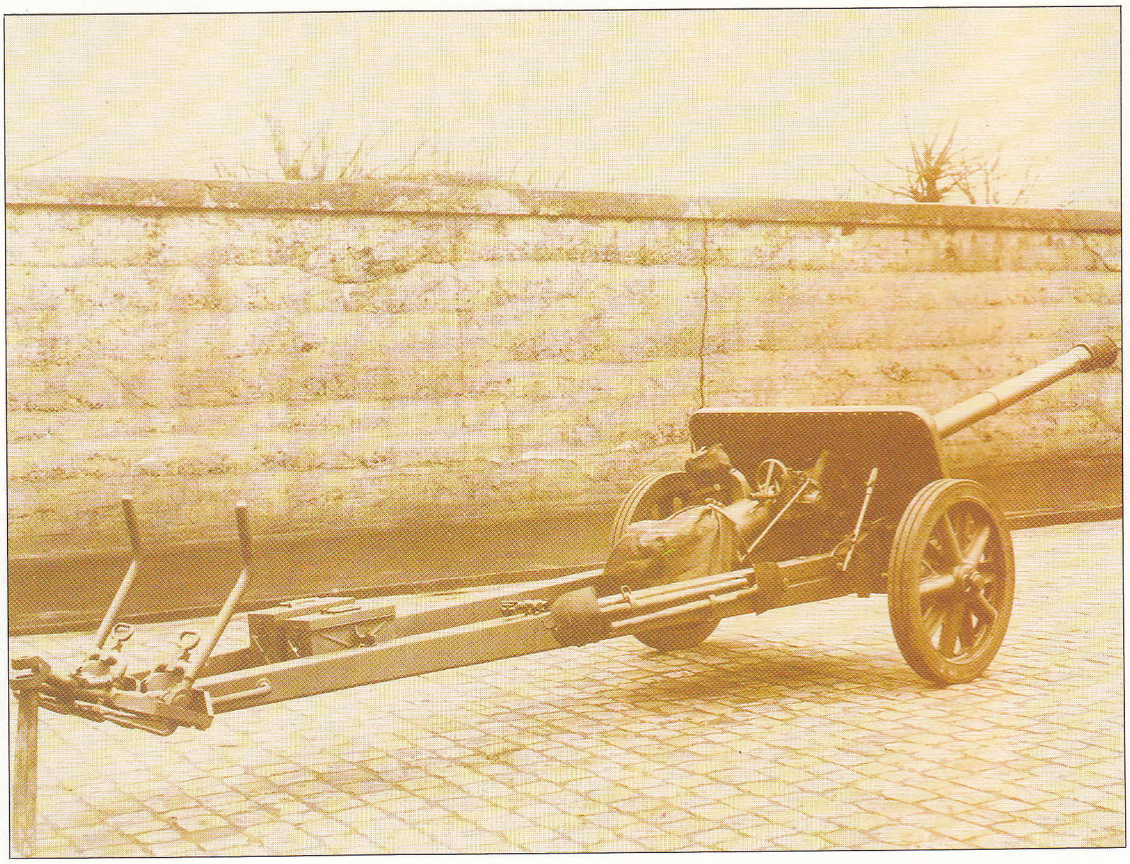
4.2-cm lePak 41
Starting calibre: 40.3 mm (1.586 in)
Emergent calibre: 29.4 mm (1.157 in)
Length of barrel: 2.25 m (7 ft 4.6 in)
Weight: in action 560 kg (1,234.5 lb)
Traverse: 60°
Elevation: −8° to +25°
Muzzle velocity: 1265 m (4,150 ft) per second
Projectile weight: AP 0.336 kg (0.74 lb)
Armour penetration: 72 mm (2.835 in) at 455 m (500 yards)

7.5-cm Pak 41
Starting calibre: 75 mm (2.95 in)
Emergent calibre: 55 mm (2.16 in)
Length of barrel: 4.32 m (14 ft 2 in)
Weight: in action 1390 kg (3,064 lb)
Traverse: 60°
Elevation: −10° to +18°
Muzzle velocity: AP 1230 m (4,035 ft) per second
Projectile weight: AP 2.5 kg (5.51 lb)
Armour penetration: 171 mm (6.73 in) at 455 m (500 yards)



Above: The 2.8-cm schwere Panzerbüchse 41 was the smallest of the German taper-bore guns, and was produced in two forms: one had large road wheels while a special airborne version, shown here, had small wheels and a light tubular alloy carriage. In this form it was used by Luftwaffe Fallschirmjäger units.

Below: A 2.8-cm schwere Panzerbüchse 41 is carried on a Kfz 15 light signals vehicle in order to provide a useful boost in firepower to a normally lightly-armed unit. The gun is carried complete with its light wheeled carriage, and could be easily lifted from the vehicle for more orthodox employment.



The 7.5-cm Pak 41 was the largest of the German taper-bore guns, but was prevented by the general tungsten shortage then prevalent in Germany from becoming the standard German army heavy anti-tank gun.

JAPAN

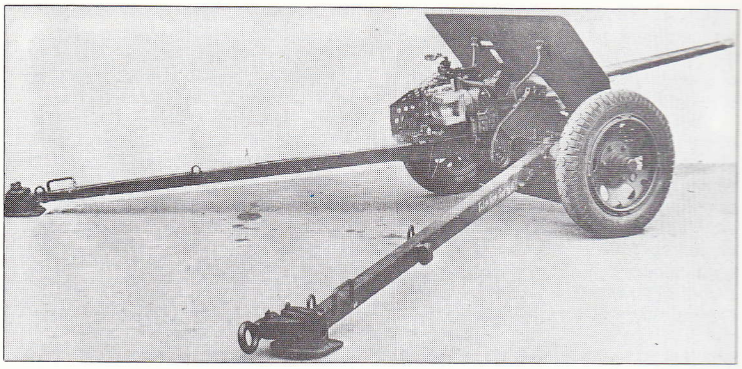
47-mm Anti-tank Gun Type 1

As with so many other weapons, Japan was short of anti-tank guns and had only a limited capacity to produce the numbers required. In 1934 it had introduced the 37-mm Gun Type 94 for use by infantry units, but realized even then that this gun would have only a limited performance, and it was therefore supplemented by the licence production of the 37-mm Anti-tank Gun Type 97, the origin of which was the German 3.7 cm Pak 35/36.

It was not until 1941 that a heavier gun was introduced in the form of the **47-mm Anti-tank Gun Type 1**. In overall design terms the Type 1 was entirely orthodox and used a split-trail carriage and a well-sloped shield. Compared with designs then being produced in Europe the Type 1 was not very powerful, but the Japanese considered it adequate as it had the advantage of a semi-automatic sliding breech carried over from the 37-mm (1.46-in) German gun, giving it a relatively high rate of fire; this was a possible 15 rounds a minute. As with many other Japanese weapons ease of handling was given high priority, and the Type 1 proved to be easy to handle in action and it was relatively light. In combat this advantage was often squandered for as the Allies advanced these guns were often statically emplaced and were manned by crews who favoured death rather than capture.

Production of the Type 1 was never sufficient to meet the needs of hard-pressed Japanese army units as the Allies advanced on all fronts, and consequently the Japanese were forced to use all manner of anti-tank methods, ranging from pressing into use naval and anti-aircraft guns to the extreme of suicide attackers armed with pole charges and explosive blocks. By 1945 the use of such measures was becoming commonplace.

Despite the fact that the Japanese learned early on in the conflict that their small tanks were likely to be of very limited use against their Allied equivalents, they still diverted a proportion of the Type 1 gun production towards producing a tank gun for their Type 97 tank. The Type 1 was regarded as the standard Japanese anti-tank gun, and most of them were issued to regimental and divisional anti-tank battalions.



Specification

47-mm Anti-Tank Gun Type 1
Calibre: 47 mm (1.46 in)
Length of barrel: 2.527 m (8 ft 3.5 in)
Weight: in action 747 kg (1,660 lb)
Traverse: 60°
Elevation: −11° to +19°
Muzzle velocity: AP 824 m (2,700 ft) per second
Projectile weight: APHE 1.528 kg (3.37 lb) and APHE 1.4 kg (3.08 lb)
Armour penetration: 51 mm (2 in) at 915 m (1,000 yards)

The Japanese Anti-tank Gun Type 1 was the only indigenous Japanese weapon produced solely for the anti-tank role, and although it was effective enough against most light Allied armour it was never produced in significant enough numbers to make any overall impression. A tank gun version was produced and the Type 1 remained in production from 1941 until the war ended in 1945.

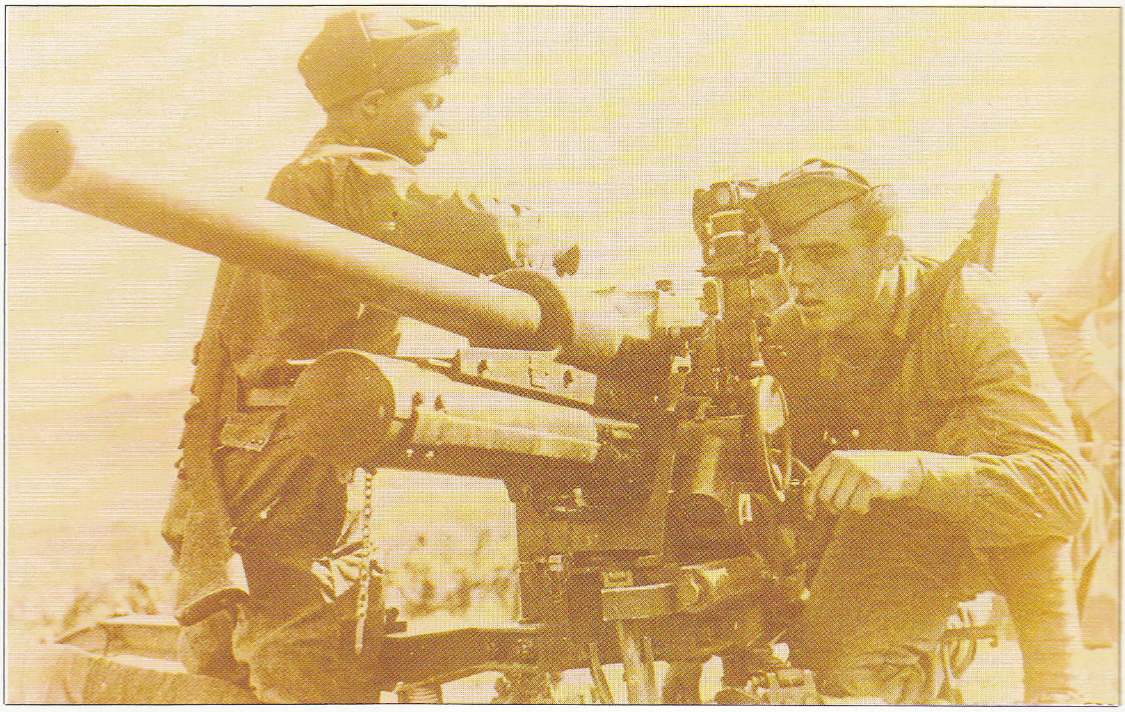
AUSTRIA

Böhler 4.7-cm anti-tank gun

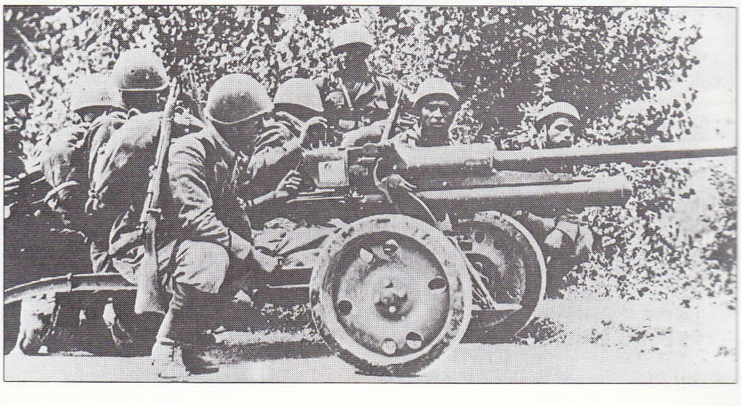
The little **Böhler 4.7-cm** (1.85-in) anti-tank gun was first produced in 1935, and is thus sometimes known as the **Model 35**. It was first produced in Austria but its use soon spread outside that nation and licences to produce the gun were taken up by Italy. In fact the Italian production run reached the point where the Böhler gun became regarded almost as an indigenous Italian weapon, the **Cannone da 47/32 M35**.

The Böhler gun was a handy weapon that was soon diverted into other roles. It was widely issued as an infantry gun and as it could be rapidly broken down into a number of pack loads it was also employed as a mountain gun. But though as it turned out the Böhler was something of a multi-purpose weapon, it was not entirely successful in any of these extra roles. It did prove to be a fairly effective anti-tank gun, however, and was widely used during the early war years by a number of nations. Italy was the main user, but others were employed by the Netherlands (**Kanon van 4.7**), and Romania, and the type also turned up in the Soviet Union (in relatively small quantities) as the **M35B**. Some also found their way into German army service when Austria came under German domination after 1938, receiving the designation **4.7-cm Pak**.

There were several developments on the basic Böhler theme that issued from the company's Kapfenberg works. Although the basic gun remained unchanged, there were numerous variations on such things as types of carriage wheel, the width of the carriage axle and so on. Some models had muzzle brakes while others did not. All models had a feature whereby the wheels could be removed and the gun then rested on the trail legs and a small platform under the axle for firing. This gave the gun a lower silhouette for firing and concealment. The gun could fire both armour piercing and high explosive projectiles, the latter having a range of



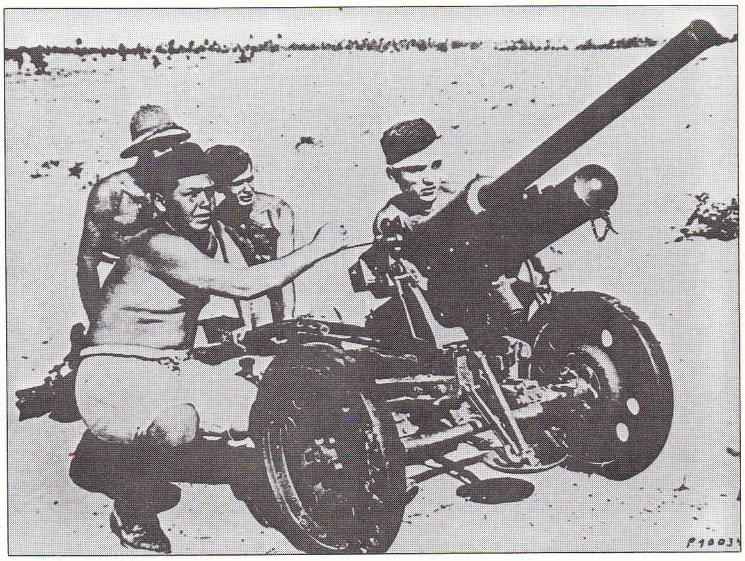
Above: In action the Böhler anti-tank gun was often used with the wheels removed and with the forward part of the carriage resting on a firing platform. A periscope sight was used, even for anti-tank use, and no shield was usually fitted. The gun could be broken down into loads for pack transport on mules.



Right: Although the 47-mm Böhler was originally an Austrian weapon, it was licence-produced in Italy to such an extent that it was regarded as an Italian weapon. It was also a multi-role weapon that was used as an anti-tank gun, an infantry gun and a mountain gun.

7000 m (7,655 yards) to provide the gun with a useful infantry support role. As the armour thicknesses of tanks increased the Böhler increasingly assumed this infantry support role.

There was one odd side-line to the story of the Böhler that is still little known. In 1942 the Allied armies in North Africa were still relatively short of many weapons and the large numbers of captured Italian Böhler guns were a useful windfall. About 100 were refurbished at a Captured Weapons Depot in Alexandria and issued to various units for second-line service. But perhaps the oddest item in this story was that 96 were actually converted by the British for use by airborne forces: the fire-control system of the original gun was altered so that one man (instead of the original two) could lay the gun, and the carriage was modified to allow dropping by parachute; a rifle telescope for aiming and a shoulder pad from a 6-pdr gun were also added. These were, according to the records, issued for service where they proved 'very popular'. Unfortunately it has not yet been possible to trace the units involved, but these Böhler guns must have been the very first guns adopted for the airborne role.



To the Italian army the 47-mm Böhler was known as the Cannone da 47/32 M35, and this example is seen in the infantry support role (the barrel is elevated for increased range) in North Africa. The firing platform for use when the wheels were removed can be seen over the axle. Many of these guns were used by the Germans later in the war, and some captured guns were used by the British.

Specification

Cannone da 47/32 M35
Calibre: 47 mm (1.85 in)
Length of barrel: 1.68 m (5 ft 6 in)
Length of bore: 1.525 m (5 ft)
Length of rifling: 1.33 m (4 ft 4.3 in)
Weight: travelling 315 kg (694.5 lb) and in action 277 kg (610.6 lb)
Traverse: 62°
Elevation: −15° to +56°
Muzzle velocity: AP 630 m (2,067 ft) per second and HE 250 m (820 ft) per second
Maximum range: HE 7000 m (7,655 yards)
Projectile weight: AP 1.44 kg (3.175 lb) and HE 2.37 kg (5.225 lb)
Armour penetration: 43 mm (1.7 in) at 500 m (550 yards)

USSR

Soviet 45-mm anti-tank guns

The Soviet Union purchased a batch of 37-mm (1.46-in) Rheinmetall anti-tank guns as early as 1930, and standardized the type as the M30 well before the German army adopted the identical model as the 3.7-cm Pak 35/36. The Soviets decided to licence-produce the 37-mm (1.46-in) gun, but in 1932 produced their own variant with a calibre of 45 mm (1.77 in). This was the **M1932**, and this could be identified by the wire-spoked wheels that were fitted to the otherwise unchanged Rheinmetall-based carriage. By 1940 there were large numbers of these guns in service with the Red Army and some had even been used in action on the Republican side during the Spanish Civil War.

In 1937 the slightly revised **Model 1937** appeared, and in the following year a tank gun variant, the **M1938**, was produced. These two guns first saw major action during the short but intense war with Finland during 1939 and 1940, but in many ways this war gave the Red Army the wrong impression of the effectiveness of their guns. The Finns had only small numbers of light armoured vehicles and the M1932 and M1937 proved quite effective against these. But when the Germans invaded the Soviet Union in 1941 the Red Army found out the hard way that its guns could not penetrate the armour of most German tanks. The only way the Red Army could stop the German attacks was to use massed artillery fire against the German formations, and although there was an obvious need for heavier anti-tank guns Soviet war industry was in no position to produce any such new weapons. The huge German advances had overrun many of the Soviet military industrial centres, and it took time to set up new facilities deep in the hinterland of the Soviet Union.

Although considered by many to be too light for really effective anti-tank use by 1945, the little 45-mm (1.77-in) Model 1942 was still in large-scale Red Army service in that year and remained so for many years thereafter. This picture shows a Model 1942 in action in early 1945 on the final approaches to Danzig as the Red Army advanced westwards during the last winter of the war.

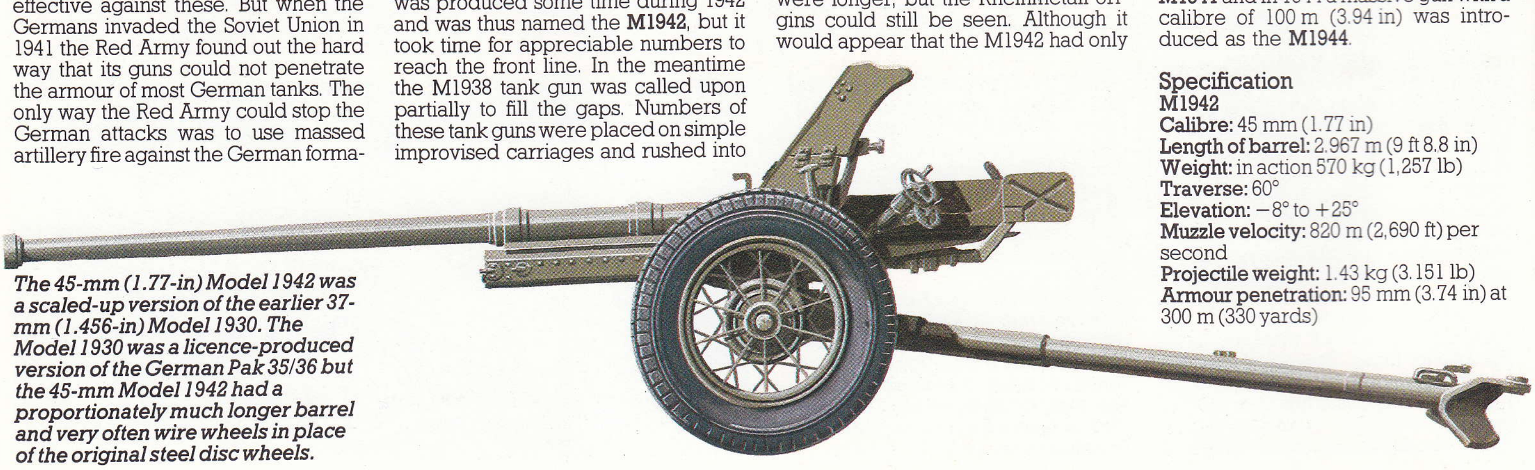
When a new gun did appear it was nothing more than a lengthened version of the existing gun. The original M32 had a barrel that was about 46 calibres long (L/46) while the new gun had a barrel that was 66 calibres long. This extension of barrel length increased the muzzle velocity and provided the projectile with more penetrating power. The new and longer gun was produced some time during 1942 and was thus named the **M1942**, but it took time for appreciable numbers to reach the front line. In the meantime the M1938 tank gun was called upon partially to fill the gaps. Numbers of these tank guns were placed on simple improvised carriages and rushed into action. These conversions were of limited value as they had only a small traverse arc, but they did work and as such were better than nothing.

When the M1942 did get into the front line it proved to be more effective than the earlier guns, but only marginally so, yet the Soviets continued to produce large numbers throughout the war. These M1942 guns had pressed steel wheels in place of the earlier wire-spoked units, and the trail legs were longer, but the Rheinmetall origins could still be seen. Although it would appear that the M1942 had only a limited performance against the later tanks the type is still in service with some of the smaller Soviet-influenced armies around the world. Some were encountered during the Korean War and during some of the Middle East wars.

In 1941 the Soviet designers followed the increase in anti-tank calibres prevalent elsewhere. The first gun to be introduced had a calibre of 57 mm (2.24 in) and is known as the **M1941** and in 1944 a massive gun with a calibre of 100 m (3.94 in) was introduced as the **M1944**.

Specification

M1942
Calibre: 45 mm (1.77 in)
Length of barrel: 2.967 m (9 ft 8.8 in)
Weight: in action 570 kg (1,257 lb)
Traverse: 60°
Elevation: −8° to +25°
Muzzle velocity: 820 m (2,690 ft) per second
Projectile weight: 1.43 kg (3.151 lb)
Armour penetration: 95 mm (3.74 in) at 300 m (330 yards)



The 45-mm (1.77-in) Model 1942 was a scaled-up version of the earlier 37-mm (1.456-in) Model 1930. The Model 1930 was a licence-produced version of the German Pak 35/36 but the 45-mm Model 1942 had a proportionately much longer barrel and very often wire wheels in place of the original steel disc wheels.

Anti-Tank Gun Tactics-1944

The war in the Soviet Union was savage in its intensity and unparalleled in scale. The early German triumphs had by 1944 turned to a struggle for survival against massive Soviet tank strength, and anti-tank methods reflected that change.

By 1944 the employment of anti-tank guns had been altered drastically from the days of 1940. This was nowhere as apparent as it was on the Eastern Front, where battles were fought by armies instead of the corps or divisions that struggled in North West Europe. Whole tank armies fell upon the Germans, who were by 1944 struggling to keep the ever-advancing Red Army away from the borders of the Third Reich. And to do this the Germans had to rely heavily on anti-tank guns of all kinds.

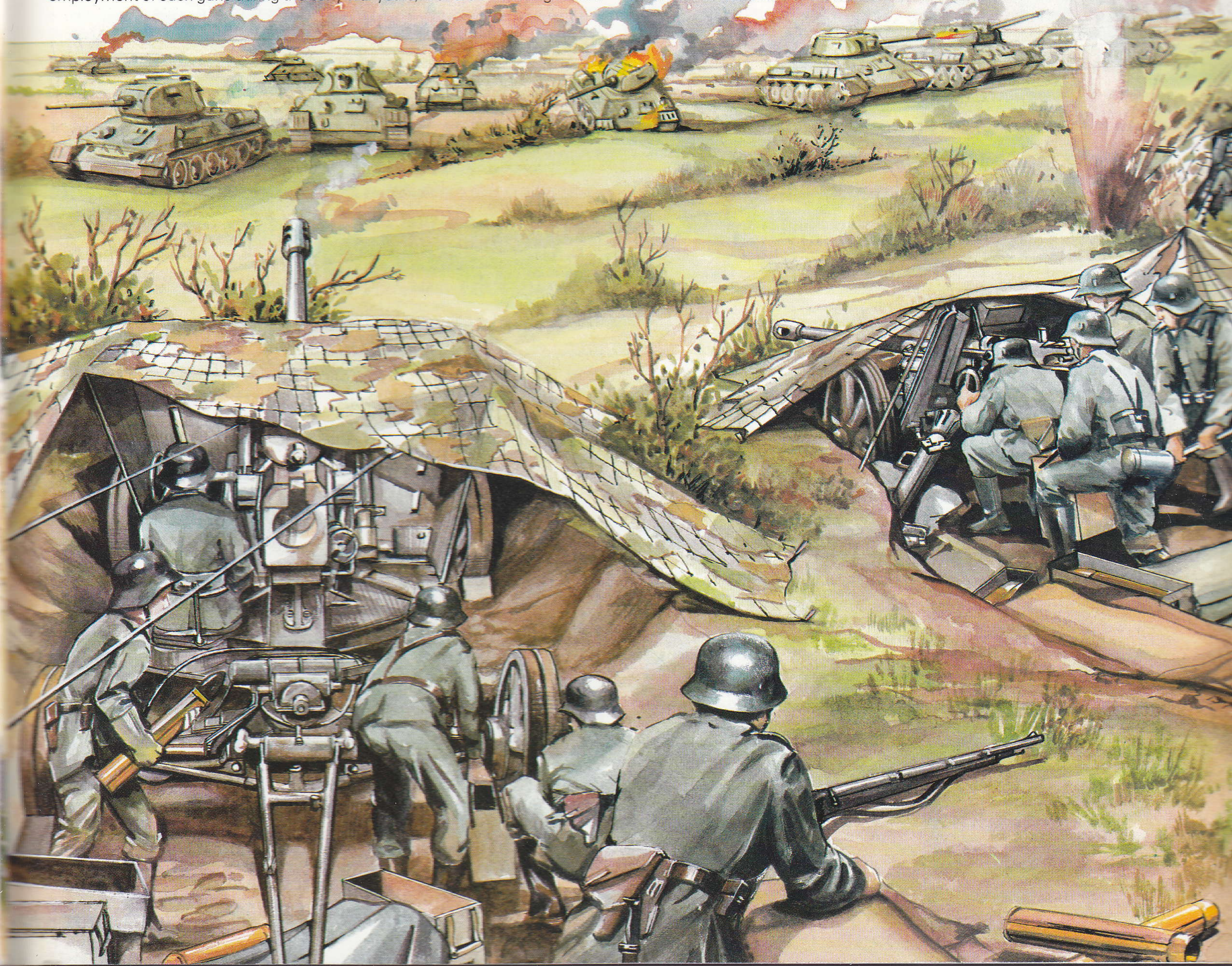
The terrain over much of the front inside the Soviet Union was open and largely uncluttered by obstacles, so here the anti-tank gun was able to engage tank targets at relatively long ranges. At the time there were all too few anti-tank guns that could be usefully employed at such ranges, and those that could were mainly the '88s'. These '88s' were either the anti-aircraft 8.8-cm Flak 18, 36 or 37 or the specialist 8.8-cm Pak 43 and Pak 43/41. But there were always too few of them, and as they could not be everywhere the gaps had to be plugged with lighter weapons. These could be the 'standard' guns such as the 7.5-cm Pak 40 or the 7.62-cm Pak 36(r) conversions. Infantry units had to rely on what they received, which was sometimes the 5-cm Pak 38 but was more likely to be some form of captured weapon culled from almost any part of Europe.

At long ranges the larger guns were used to keep the attacking tanks at bay. Thus the '88s' were often used in troops or even whole 12-gun batteries that could concentrate their fire on specific points. The control of these troops or batteries was usually carried out from a single point that could call down fire on specific targets for maximum effect. Where possible the guns were deployed in carefully emplaced positions (a singular contrast with the open and mobile employment of such guns during the early war years). For the anti-tank gunners this was necessitated by the fact that their targets were often equipped with guns of similar calibres to their own that could fire back once the anti-tank guns had been detected. The concealment also enabled the anti-tank gunners to hold their fire as long as possible, so luring targets as close as possible to allow the guns to have maximum effect. But the gun crews had to be experts in getting their guns in and out of action as swiftly as possible. In an emergency a few seconds either way could spell success or failure, and on the Eastern Front the rewards of failure were usually fatal.

The smaller-calibre guns, including the 75-mm (2.95-in) guns, were usually emplaced to cover specific points such as infantry positions or field gun batteries. By 1944 it was common for virtually every type of unit to have its own attached anti-tank gun, even if it was only one gun (this practice was extended even to coastal gun batteries) so the control of these lighter guns was more often delegated to the individual gun commanders. These smaller guns had often to rely on concealment to obtain surprise and maximum effects. At times this led to the use of specially constructed gun pits and careful camouflage.

On the Soviet side the approach to anti-tank defence was much simpler. They had produced a small family of 45-mm (1.77-in) guns that proved to be of limited value after 1942-3, and in 1941 they even produced a 57-mm (2.24-in) anti-tank gun. These guns were retained in use as part of a simple anti-tank doctrine: this was that every gun, whatever its calibre or primary function, was an anti-tank gun, and that the duty of any gun crew when it saw a tank was to point the barrel at that tank, open fire and keep on firing. Thus whenever the Germans were in a position to mount a tank attack of any scale they moved forward into a storm of artillery fire that varied in calibre from heavy machine-guns up to 152-mm (6-in) howitzers. This simple ploy worked wonders, for although ordinary high explosive shells were not always able to knock out a tank they were often able to inflict a great deal of secondary damage to items such as vision devices and running gear, so effectively disabling the tank.

In the duel between the Soviet tank forces and German anti-tank gunners, experienced gun crews allowed the T-34s to get very close to ensure kills. Failure could mean destruction at the hands of the Soviet tank gunners, or worse under the tracks of the tanks.



USSR

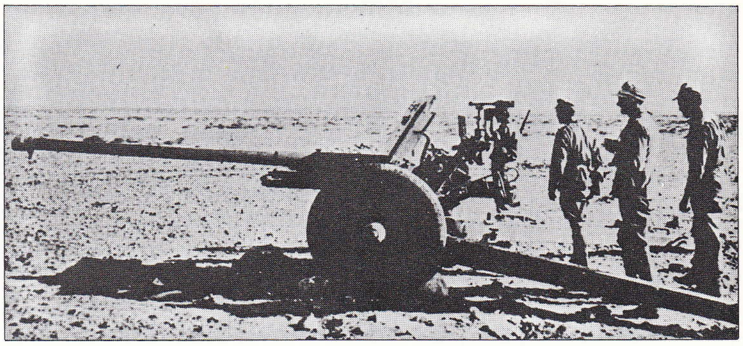
Soviet 76.2-mm guns

One of the most widely used of the German heavy anti-tank guns was not originally a German weapon at all but a Soviet design. This hybrid weapon was originally designed as a field gun and was known as the 76.2-mm (3-in) **M1936**. It was the latest in a line of gun designs that stretched back many years, and the first of them were issued to the Red Army during 1939. The M1936 was a rather heavy gun for the field role and it possessed a long slender barrel mounted on a heavy but strong carriage that was ideally suited to the harsh conditions of the Soviet terrain.

In 1941 the lack of a suitable anti-tank gun other than the 45-mm (1.77-in) M1932 led to the simple expedient of using field guns for defence against tanks. In this role the M1936 proved itself to be an excellent anti-armour gun and, even firing high explosive shells, was powerful enough to inflict damage on German tanks of all kinds. This fact was duly noted by the Germans when they came to contemplate a use for the huge stockpiles of M1936 guns that they captured during 1941 and 1942. Many were simply turned around against their former owners, but large numbers were returned to Germany where they were reconditioned and altered to accommodate German ammunition. A muzzle brake was added and the fire controls altered for the anti-tank role, the result being the **7.62-cm Pak 36(r)**, an excellent heavy anti-tank gun that was used on all fronts from North Africa to the Soviet Union.

Back in the Soviet Union, as early as 1939 a new field gun lighter than the M1936 was produced as the **M1939**. This was overall smaller than the M1936 with a shorter barrel. Again, many fell into German hands in 1941, and these were converted for German use, some as anti-tank guns. The Soviet designers produced other 76.2-mm (3-in) field guns in 1941 and at one desperate point were even placing 76.2-mm (3-in) tank guns on lash-up carriages in order to produce something to keep the advancing German forces at bay, but in 1942 came the first of what can be regarded as dual-purpose guns.

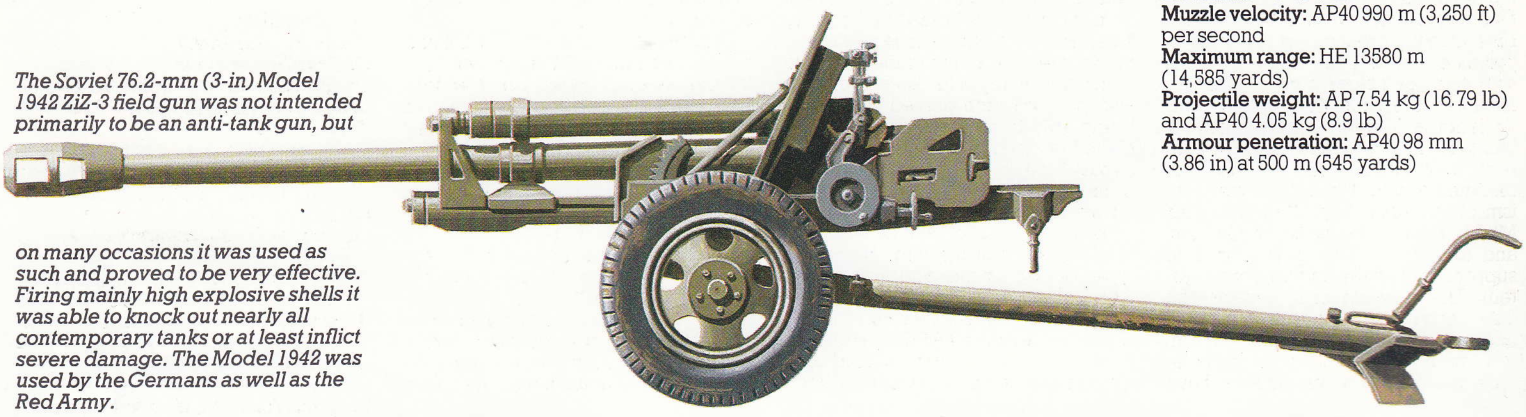
This was the 76.2-mm (3-in) **M1942**, or **ZiZ-2**, a handy and light field gun that could be readily used as an anti-tank gun if and when necessary. The M1942 had a light carriage that used split tubular trails, and the gun barrel was fitted with a muzzle brake. By the time it first appeared at the front, the Red Army was well versed in the art of using field artillery against attacking armoured vehicles and during many battles the Red Army relied on field guns alone for defence. They simply turned their guns, of all calibres, against the target and started firing. The M1942 was ideal for this type of employment for it was well-balanced and handy. It was also very sturdy, and as it fired a shell weighing 6.21 kg (13.69 lb), it could pack a useful punch when fired against tanks. The M1942 turned out to be one of the best artillery pieces ever produced in the Soviet Union, where the type was churned out in thousands, and the type still remains a front-line equipment with many armies around the world. Between 1943 and 1945 the German also found any captured examples very useful indeed.



A Soviet 76.2-mm (3-in) Model 1936 field gun in service with the Germans in North Africa converted for the anti-tank role as the 7.62-cm Pak 36 (r). In this form the Soviet gun made an excellent specialist anti-tank gun and was considered by many to be one of the best all-round anti-tank guns in use anywhere during World War II.

Specification

7.62-cm Pak 36(r)
Calibre: 76.2 mm (3 in)
Length of piece: 4.179 m (13 ft 8.5 in)
Length of rifling: 2.93 m (9 ft 7.3 in)
Weight: in action 1730 kg (3,770 lb)
Traverse: 60°
Elevation: −6° to +25°
Muzzle velocity: AP40 990 m (3,250 ft) per second
Maximum range: HE 13580 m (14,585 yards)
Projectile weight: AP 7.54 kg (16.79 lb) and AP40 4.05 kg (8.9 lb)
Armour penetration: AP40 98 mm (3.86 in) at 500 m (545 yards)



The Soviet 76.2-mm (3-in) Model 1942 ZiZ-3 field gun was not intended primarily to be an anti-tank gun, but on many occasions it was used as such and proved to be very effective. Firing mainly high explosive shells it was able to knock out nearly all contemporary tanks or at least inflict severe damage. The Model 1942 was used by the Germans as well as the Red Army.

USA

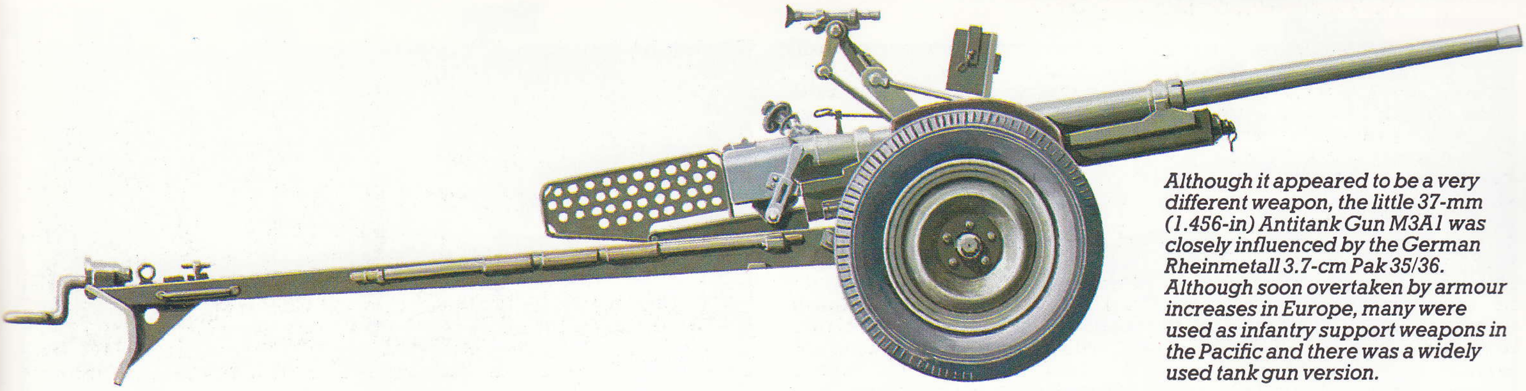
37-mm Antitank Gun M3

When the US Army Ordnance Department decided to develop an anti-tank gun before 1939 it obtained an example of the German 3.7-mm Pak 35/36, and using this as a starting point proceeded to design a similar weapon, also in 37-mm (1.46-in) calibre. The result was outwardly different from the German original but was in fact closely influenced by it. The American gun was designated the **37-mm Antitank Gun M3**, but only a few had been made before it was decided to fit the gun with a muzzle brake, the change making the M3 the **M3A1**.

The muzzle brake was fitted in an attempt to reduce the recoil forces on the carriage, which was even lighter than the German original, but as it was soon discovered that the muzzle brake was unnecessary it was removed, though the guns were still produced with the fixtures on the muzzle for ease of production. The rest of the gun and carriage was quite unremarkable. The carriage used the usual split trails but the main carriage axle was rather wider than on other similar designs. A small flat shield was provided for the gun crew and the breech mechanism was copied direct from the German gun and remained a vertical drop block.

By the time the M3A1 had been taken into service it was obsolete. By 1941 events elsewhere had demonstrated that something larger than 37 mm (1.46 in) would be required to penetrate the armoured hides of in-service enemy tanks and although the M3A1 was used in North Africa by the US Army the type was withdrawn there and replaced by heavier guns. But it was different in the Pacific theatre. There the expected enemy tanks were light (and in any event few and far between), so a place could be found for the M3A1 as an infantry support weapon. High explosive and canister rounds were developed for use during the various island-hopping campaigns and the armour-piercing projectiles were often called upon during 'bunker-busting' operations. The light weight and handiness of the gun proved to be highly effective dur-

Although the European war had shown it to be obsolete, the 37-mm M3 was still in US Army use at the Kasserine Pass in 1943, where its inadequacy against the veteran Afrika Korps armour was disastrous. It was soon to be withdrawn from the European theatre.



Although it appeared to be a very different weapon, the little 37-mm (1.456-in) Antitank Gun M3A1 was closely influenced by the German Rheinmetall 3.7-cm Pak 35/36. Although soon overtaken by armour increases in Europe, many were used as infantry support weapons in the Pacific and there was a widely used tank gun version.

ing these amphibious operations, so production continued specifically for the Pacific operations. By 1945 no fewer than 18,702 M3s had been produced. A tank gun version was also produced for use in American light tanks and armoured cars.

After 1945 many M3A1s were handed out to nations friendly to the Americans, and many are still in use in some Central and South American states. Numbers were also converted to become saluting guns with blank cartridges.

During World War II many attempts were made to turn the M3A1 into a self-propelled anti-tank weapon, but very few were ever used operationally for the simple reason that the gun lacked the power to tackle the tanks it was likely to encounter in the field. But as an infantry support gun it proved to be excellent.

Specification

37-mm Antitank Gun M3A1
Calibre: 37 mm (1.45 in)
Length of piece: 1.979 m (6 ft 10.5 in)
Weight: travelling 410.4 kg (912 lb)
Traverse: 60°
Elevation: −10° to +15°
Muzzle velocity: AP 885 m (2,900 ft) per second
Maximum effective range: 457 m (500 yards)
Projectile weight: 0.86 kg (1.92 lb)
Armour penetration: 25.4 mm (1 in) at 915 m (1,000 yards)

USA

3-in Antitank Gun M5

When the US Army Ordnance Department decided during 1942 to produce a new heavy anti-tank gun it took a course of action that had already been taken elsewhere: it decided to combine existing weapon components to produce a new gun. The result was something of a 'dog's dinner'. The gun itself was taken from the 3-in (76.2-mm) Antiaircraft Gun M3 but the chamber had to be altered slightly to take different ammunition. The new gun was modified to take the breech mechanism of the 105-mm (4.13-in) Howitzer M2A1, then in full-scale production, and the same howitzer was used to supply the carriage and the recoil system. The new carriage became the Gun Carriage M1 and in this form the original straight shield of the 105-mm (4.13-in) howitzer was retained but in time the shield was modified to have sloping shield plates and this became the M6.

The new gun became the **3-in Antitank Gun M5**, and it turned out to be a remarkably workmanlike-looking weapon. It was rather large and heavy for its role, but in this respect was no worse than many of its contemporaries and in action soon proved capable of being able to penetrate up to 84 mm (3.3 in) of sloping armour at ranges of almost 2000 m (2,190 yards). Not surprisingly the M5 proved to be a popular weapon with the anti-tank batteries of the US Army, and the type was used in all theatres of the war. Numerous types of armour-piercing ammunition were developed for the M5, but one of the more widely used was the capped armour-piercing (APC) projectile known as the M62. But the M5 did have a disadvantage and that was its weight. Rapid movement of the M5 proved to be a major task, and a heavy 6×6 truck had to be used to tow the weapon although lighter tractors could be used on occasion.

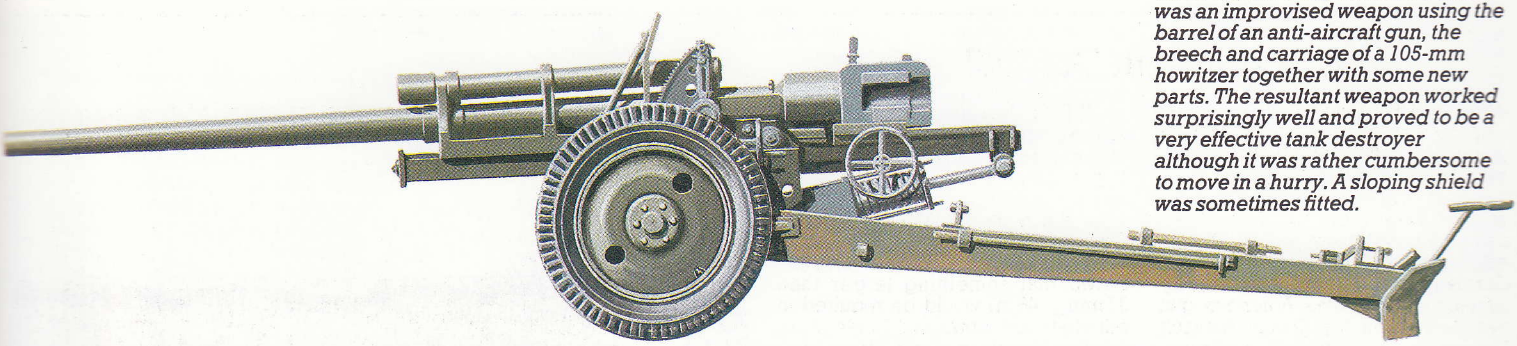
The first M5s were issued for service in December 1941 but it took time for the weapon to be issued widely. The M5 was also in demand as the armament for a series of self-propelled tank destroyer projects, the most important of which turned out to be the **M10A1**, an open-topped M4 Sherman variant that mounted the M5 in a special turret. The importance of this demand can be seen as 2,500 M5s were completed for the anti-tank gun role but 6,824 guns for the M10A1.

Despite its success, once the war ended the M5 was gradually withdrawn from US Army service and passed to reserve units. It was overtaken by newer and more technologically advanced forms of anti-tank weapon and few remained in use after 1950.

Specification

3-in Antitank Gun M5
Calibre: 76.2 mm (3 in)
Length of piece: 4.023 m (13 ft 2.4 in)
Weight: travelling 2632.5 kg (5,850 lb)
Traverse: 46°
Elevation: −5.5° to +30°
Muzzle velocity: AP 793 m (2,600 ft) per second, APC 853 m (2,800 ft) per second
Maximum effective range: 1830 m (2,000 yards)
Projectile weight: AP and APC 6.94 kg (15.43 lb)
Armour penetration: 84 mm (3.31 in) at 1830 m (2,000 yards)

The 3-in (76.2-mm) Antitank Gun M5 was an improvised weapon using the barrel of an anti-aircraft gun, the breech and carriage of a 105-mm howitzer together with some new parts. The resultant weapon worked surprisingly well and proved to be a very effective tank destroyer although it was rather cumbersome to move in a hurry. A sloping shield was sometimes fitted.



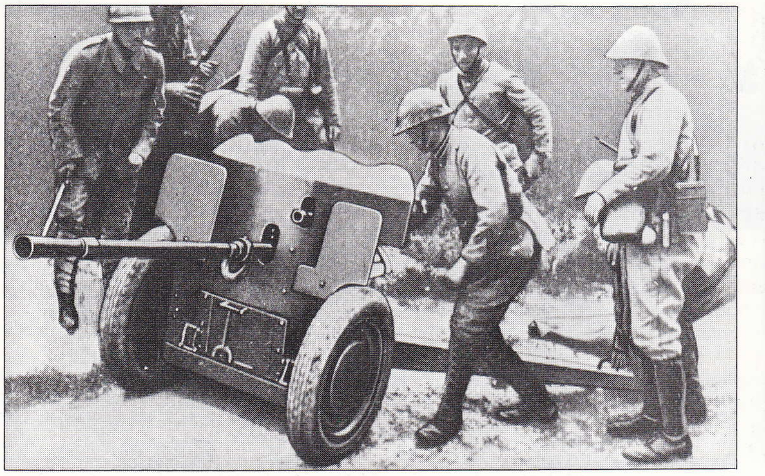
FRANCE

25-mm anti-tank guns

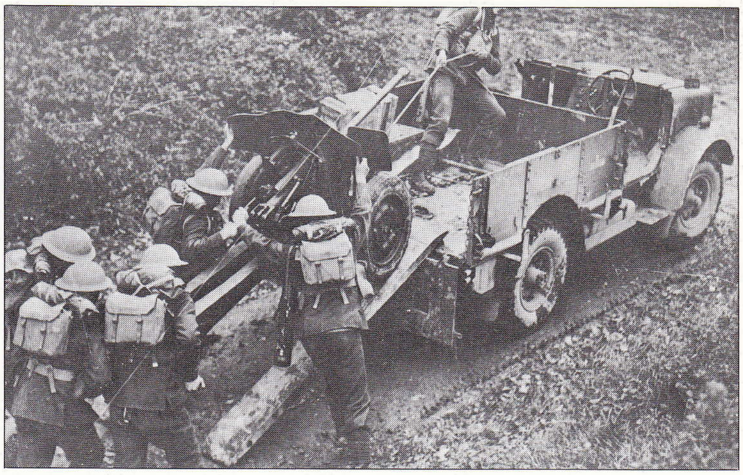
The first of two French 25-mm (0.98-in) anti-tank guns (in many references the correct term should be cannon instead of guns as the calibre of 25 mm is generally considered too light to apply to a gun) was the **Canon léger de 25 antichar SA-L mle 1934**. Produced by Hotchkiss et Cie, this weapon was based on the design of a gun originally intended for use in World War I tanks but too late for that conflict as its development was not completed until 1920. In 1932 Hotchkiss conceived the idea of placing the design on a light wheeled carriage in response to a French army requirement. The design was adopted in 1934 (hence the mle 1934 in the designation), and by 1939 there were well over 3,000 such equipments in service with the French army.

The other French 25-mm (0.98-in) gun was the **Canon léger de 25 antichar SA-L mle 1937**. This was a later arrival, designed and developed by the Atelier de Puteaux (APX), and first offered for service in 1937. It was not adopted for service until 1938 and the numbers produced for service never approached those of the mle 1934. In appearance the mle 1937 looked very similar to the mle 1934, but it was much lighter and had a slightly longer barrel. In fact the two guns were intended for different service roles: the mle 1934 was issued to nearly all French army armoured units and specialized anti-tank units, while the mle 1937 was intended for use by the support companies of infantry battalions. The latter equipments were towed by horses, one horse pulling the gun towed behind a small limber vehicle, this carrying the ammunition and all the gun crew's kit and equipment. When the mle 1937 was towed in this fashion the cone-shaped muzzle brake was removed and stowed over the breech.

The mle 1934 was a serviceable



The Canon léger de 25 antichar SA-L mle 1934 was a light and handy weapon that proved to be virtually useless against even the lightest tank armour in 1940. This retouched picture is from a newspaper printed in late 1939.



The little French 25-mm Hotchkiss guns, once issued to the BEF, proved light enough to be carried on 15 cwt trucks, which was just as well as they proved too flimsy for normal towing behind the truck. As such they were the first of the British Army's portée anti-tank guns.

enough weapon, but its calibre was too small for the gun to be of much use against the German armour that swept across France in 1940. By that time the mle 1934 was also in use with the British army. In a show of Allied co-operation it had been decided that the BEF would use the mle 1934 as its anti-tank gun but this did not turn out well in practice. The BEF was the only all-mechanized formation in Europe at that time and when it tried to tow the mle 1934s behind its vehicles the guns very quickly proved to be too flimsy to withstand the hard knocks involved. Thus the BEF carried the guns on its vehicles and the mle 1934 became the first British portée guns. The mle 1937 fared even less well in service. It was even less stoutly built than the mle 1934 and ran into weakness problems even when confined to the horse-drawn role. But the main problem with both guns was that the round they fired was too small to make any sort of impact on attacking armour and their combat ranges were limited to something like 300 m (330 yards). Even in 1940 this was far too low for tactical comfort, but the French army had invested heavily in the 25-mm (0.98-in) guns, so all too often they were the only such weapons available.

In the 1940 campaign large numbers of these 25-mm (0.98-in) guns fell into the hands of the Germans, who retained some for a while under the designations **2.5-cm Pak 112(f)** and **2.5-cm Pak 113(f)** to provide their occupation divisions with some form of anti-tank weapon. They do not appear to have been used long after 1942.

Specification

Canon léger de 25 antichar SA-L mle 1934
Calibre: 25 mm (0.98 in)
Length of barrel: 1.8 m (5 ft 10.8 in)
Weight: in action 496 kg (1,093.5 lb)
Traverse: 60°
Elevation: −5° to +21°
Muzzle velocity: 918 m (3,012 ft) per second
Maximum range: 1800 m (1,968 yards)
Projectile weight: (AP) 0.32 kg (0.7 lb)
Armour penetration: at 25° 40 mm (1.57 in) at 400 m (440 yards)

Canon léger de 25 antichar SA-L mle 1937
Calibre: 25 mm (0.98 in)
Length of barrel: 1.925 m (6 ft 3.8 in)
Weight: in action 310 kg (683.5 lb)
Traverse: 37°
Elevation: −10° to +26°
Muzzle velocity: 900 m (2,953 ft) per second
Maximum range: 1800 m (1,968 yards)
Projectile weight: (AP) 0.32 kg (0.7 lb)
Armour penetration: at 25° 40 mm (1.57 in) at 400 m (440 yards)

FRANCE

Canon de 47 antichar SA mle 1937

The best of the French anti-tank guns was the **Canon de 46 antichar SA mle 1937**, a design that originated with the Atelier de Puteaux. It was developed in a great hurry and introduced into service once the French army had been provided with indications of the armour thickness of the German PzKpfw IV tank. Considering the rush with which the mle 1937 was developed it was an excellent anti-tank weapon and one of the best in service anywhere in 1939. The main trouble for the French army was that there were not enough of them to hand during the events of May 1940.

The mle 1937 was introduced into limited service in 1938, but the main production run was in 1939. The type was issued to French artillery batteries operating in support of army divisions and brigades, and was operated in batteries, each battery having six guns. The equipments were usually towed into action behind Somua half-tracks, and in action their low outlines made them easy to conceal. They were capable of penetrating the armour of any tank likely to be put into action against them. In appearance the mle 1937 looked powerful and low. The gun had a barrel nearly 2.5 m (8 ft 2 in) long, and the carriage used pressed steel wheels with solid rubber rims. On top of the shield there was the fashionable corrugated outline to break up the shape.

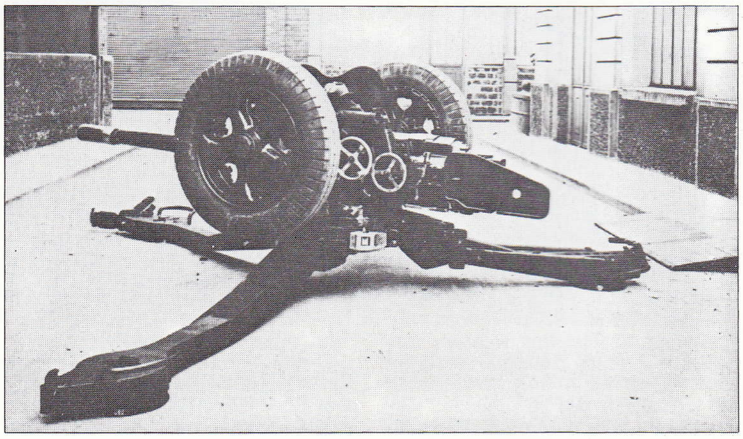
Along with production of the towed anti-tank model of the mle 1937 went production of a very similar gun intended for use in the permanent fortifications of the Maginot Line. This version lacked the carriage of the towed version and instead was swung into its firing position (through specially constructed firing slits) suspended from overhead rails. In 1939 there appeared a slightly revised version of the mle 1937 known as the **Canon de 47 antichar SA mle 1937/39**, but the detailed differences between these two guns were slight. In 1940 there appeared the **Canon de 47 antichar SA mle 1939** and this was a quite different weapon. It used the gun of the mle 1937, but mounted on a new tripod carriage so arranged that once it was emplaced the gun could be swung through 360° to fire against targets appearing from any point of the compass. To emplace the gun a forward leg of the tripod was swung down, the trail legs were spread and the wheels were then raised to positions on each side of the shield. This futuristic concept was doomed never to see service, for the events of May 1940 intervened before production could start.

May and June 1940 saw the bulk of the French mle 1937s pass into German hands. The Germans regarded the mle 1937 very highly, for many of their tanks had suffered from the striking power of the gun, and after 1940 they used the mle 1937 widely as the **4.7-cm Pak 141(f)**; the gun was still in service when the Allies landed in Normandy in June 1944. Before that the Germans had also used the mle 1937 to arm many of their early Panzerjäger (tank hunter) conversions produced by removing the turrets from captured French tanks and replacing them with anti-tank guns on open mountings.

Specification

Canon de 47 antichar SA mle 1937
Calibre: 47 mm (1.85 in)
Length of barrel: 2.49 m (8 ft 2 in)
Weight: travelling 1090 kg (2,403 lb) and in action 1050 kg (2,315 lb)
Traverse: 68°
Elevation: −13° to +16.5°
Muzzle velocity: 855 m (2,805 ft) per second
Maximum range: 6500 m (7,110 yards)
Projectile weight: 1.725 kg (3.8 lb)
Armour penetration: 80 mm (3.15 in) at 200 m (220 yards)

The Puteaux mle 1939 was a more involved development of the mle 1937 47-mm (1.85-in) anti-tank gun, which had a conventional wheeled carriage. The mle 1939 used a complex all-round-traverse carriage, although some were produced with normal wheeled carriages.



Armed Forces of the World

US Air Force

Part 2

A couple of other SAC units are located overseas, these also falling within the numbered Air Forces detailed earlier. These units are responsible for air refuelling support and strategic reconnaissance: Anderson AFB, Guam, is home to the 3rd Air Division (15th Air Force) which has a single Strategic Wing on the same base with B-52s as well as the 376th SW at Kadena, the latter having some RC-135s with the 82nd SRS and a mixed fleet of KC-135As and KC-135Qs with the 909th Air Refuelling squadron. In Europe, the 7th Air Division (8th Air Force) at Ramstein oversees the activities of a number of units including the 306th SW at RAF Mildenhall, Suffolk, with rotational tankers; the 11th Strategic Group at RAF Fairford, Glos, also with rotational tankers; and the 17th Reconnaissance Wing at RAF Alconbury, Cambs, which in the autumn of 1983 had three of a planned total of 18 TR-1s for battlefield surveillance and other reconnaissance functions. RC-135s from the 55th SRW also routinely operate from Mildenhall and Hellenikon, Athens, on a temporary duty basis, whilst SAC's other reconnaissance unit, the 9th SRW, maintains detachments of U-2Rs and/or SR-71As at Kadena, Mildenhall, Osan (on TDY from Kadena), Akrotiri and Patrick.

With regard to the bomber force, the Short-Range Attack Missile (SRAM) has, in conjunction with gravity-fall nuclear bombs, been the predominant weapon system of recent years but increasing doubts about the ability of the B-52 to survive in the face of Soviet defences has resulted in a shift in philosophy coincident with deployment of the Boeing AGM-86B ALCM (Air-Launched Cruise Missile). Recently introduced to operational service with the 416th BW at Griffiss AFB, New York, and earmarked for some 200 B-52s as well as the forthcoming Rockwell B-1B, ALCM will permit the Stratofortress fleet to operate in either 'stand-off' or 'shoot and penetrate' modes, the former envisaging ALCM-armed B-52s launching missiles from a position of relative safety outside Soviet territory whilst the latter involves firing of missiles before penetration for delivery of gravity weapons. Avionics improvements will enhance the survivability of the B-52 fleet in the near- to mid-term, but long-term planning currently anticipates those B-52s which are still in service in the 1990s being mainly employed in the stand-off role, responsibility for penetration falling upon the B-1B and the 'AT' (Advanced Technology) or 'Stealth', bomber.

Incorporating some elements of 'Stealth' technology, the B-1B will be the first new purpose-built aircraft to join the SAC inventory for over 25 years when it begins to enter service with the 96th BW at Dyess AFB, Texas, during 1985. Current planning calls for the acquisition of exactly 100 aircraft by mid-1988 and it will bring about a significant and long-overdue improvement on both the nuclear and conventional bombing fronts with effect from June 1986, when the first 15 aircraft are expected to attain initial operational capability.

Existing missile forces have also been subject to some improvements in recent years, this effort being devoted mainly to enhanced target selection capability and silo upgrading to provide improved protection against blast and electro-magnetic pulse effects. But once again, the two basic weapons (Minuteman and Titan) are essentially old systems. Deployment of the new MEM-118 Peacekeeper ICBM, each of which will carry 10 independently-targeted warheads, will go some way towards closing the so-called 'window of vulnerability' from 1986, when the first 40 missiles are expected to go on alert. In the meantime, the Minuteman will continue in service, no less than 1,000 missiles of this type being operational with six Missile Wings. Of this total, 450 are single-warhead LGM-30F Minuteman IIs, the balance being LGM-30G Minuteman IIIs with MIRV (Multiple Independently-targeted Re-entry Vehicle) capability, each having three Mk 12 warheads; plans are now in hand to update 50 LGM-30Fs to MIRV standard, an action which should more than compensate for the loss of 52 LGM-25C Titans. Earmarked for withdrawal by 1987, the Titan is SAC's oldest ICBM, dating to the late 1950s in its original form, and it has been the cause of some embarrassment in recent years as a result of two separate silo explosions. This, combined with its being increasingly expensive to maintain, has conspired to bring about the type's gradual retirement from the nuclear arsenal.

SAC is also responsible for providing inflight-refuelling support to all elements of the USAF and currently maintains a fleet of approximately 500 KC-135 Stratotankers in some 32 squadrons, these being ably supported by a further 128 aircraft of this type operated by ANG and AFRes units. The KC-135 is another veteran, and efforts are being made to improve performance and extend service life by means of re-engining and wing-strengthening programmes. Re-engining has thus far been largely confined to installing refurbished surplus civilian Pratt & Whitney JT-3D turbofans on a number of ANG machines, the resulting aircraft being known as KC-135Es, but the most significant proposal envisages fitting brand-new General Electric/SNECMA CFM-56-2B1 turbofan engines to about 300 Stratotankers and a prototype of this model, known as the KC-135R, has now completed flight trials at Edwards AFB. Modified aircraft will be able to remain in front-line service until well into the 21st century, but other efforts to overcome the present shortage of tanker aircraft centre around acquisition of the McDonnell Douglas KC-10A Extender, close to 20 aircraft of this type now being active of the 60 that will eventually be obtained. Tanker capability combines with an impressive payload to make the Extender a valuable addition to the inventory, the KC-10 being particularly useful when operating in support of tactical aircraft engaged in the overseas deployments which are now a routine feature of USAF operations.

USAF
U.S. AIR FORCE
17965

A Boeing KC-135Q Stratotanker of the 100th ARW transfers special JP7 fuel to a Lockheed SR-71A Blackbird of the 9th SRW.

A Martin Marietta MEM-118 Peacekeeper ICBM is test launched. The missile has 10 independently-targeted re-entry vehicles, meaning that each missile can engage 10 widely separated targets.

STRATEGIC AIR COMMAND

HEADQUARTERS OFFUTT AFB, Ne
- 8th Air Force, Barksdale AFB, La
- 15th Air Force, March AFB, Ca
- 1st Strategic Aerospace Division, Vandenberg AFB, Ca
- 1st Combat Evaluation Group, Barksdale AFB, La
- 544th Strategic Intelligence Wing, Offutt AFB, Ne
- 3902nd Air Base Wing, Offutt AFB, Ne

1ST STRATEGIC AEROSPACE DIVISION, VANDENBERG AFB, Ca
- 394th ICBM Test Maintenance Squadron
- 4315th Combat Crew Training Squadron
- 4392nd Aerospace Support Group

15TH AIR FORCE, MARCH AFB, Ca
- 3rd AD, Andersen AFB, Guam
  - **43rd SW, Andersen AFB, Guam**
    - 60 BS (B-52H)
    - TDY (KC-135A)
  - **376th SW, Kadena AB, Okinawa**
    - 909 ARS (KC-135A/Q)
    - 82 SRS (RC-135)
- 4th AD, F.E. Warren AFB, Wy
  - **90th SMW, F.E. Warren AFB, Wy**
    - 319/320/321/400 SMS (LGM-30G)
  - **319th BW, Grand Forks AFB, ND**
    - 46 BS (B-52G)
    - 905 ARS (KC-135A)
  - **321st SMW, Grand Forks AFB, ND**
    - 446/447/448 SMS (LGM-30G)
- 12th AD, Dyess AFB, Tx
  - **22nd ARW, March AFB, Ca**
    - 9 ARS (KC-10A)
    - 22 ARS (KC-135A)
  - **55th SRW, Offutt AFB, Ne**
    - 1 ACCS (E-4A/B)
    - 2 ACCS (EC-135C)
    - 343 SRS (RC-135)
  - **96th BW, Dyess AFB, Tx**
    - 337 BS (B-52H)
    - 917 ARS (KC-135A)
  - **390th SMW, Davis-Monthan AFB, Az**
    - 570/571 SMS (LGM-25C)
- 14th AD, Beale AFB, Ca
  - **9th SRW, Beale AFB, Ca**
    - 1 SRS (SR-71A/B, T-38A)
    - 99 SRS (U-2R)
    - 4029 SRTS (TR-1A/B, U-2CT)
    - 349/350 ARS (KC-135Q)
    - Det 1 – Kadena, Okinawa (SR-71A)
    - Det 2 – Osan, Korea (U-2R)
    - Det 3 – Akrotiri, Cyprus (U-2R)
    - Det 4 – Mildenhall, UK (SR-71A)
    - Det 5 – Patrick AFB, Fl (U-2R)
  - **93rd BW, Castle AFB, Ca**
    - 328 BS (B-52G)
    - 4017 CCTS (B-52G)
    - 93/924 ARS (KC-135A)
- 47th AD, Fairchild AFB, Wa
  - **6th SW, Eielson AFB, Ak**
    - 24 SRS (RC-135)
    - TDY (KC-135)
  - **92nd BW, Fairchild AFB, Wa**
    - 325 BS (B-52G)
    - 43/92 ARS – (KC-135A)
  - **320th BW, Mather AFB, Ca**
    - 441 BS (B-52G)
    - 904 ARS (KC-135A)
  - **341st SMW, Malmstrom AFB, Mt**
    - 10/12/490 SMS (LGM-30F)
    - 564 SMS (LGM-30G)
- 57th AD, Minot AFB, ND
  - **5th BW, Minot AFB, ND**
    - 23 BS (B-52H)
    - 906 ARS (KC-135A)
  - **28th BW, Ellsworth AFB, SD**
    - 77 BS (B-52H)
    - 28 ARS (KC-135A)
    - 4 ACCS (EC-135A/C/G)
  - **44th SMW, Ellsworth AFB, SD**
    - 66/67/68 SMS (LGM-30F)
  - **91st SMW, Minot AFB, ND**
    - 740/741/742 SMS (LGM-30G)

8TH AIR FORCE, BARKSDALE AFB, La
- 7th Air Division, Ramstein AB, West Germany
  - **11th Strategic Group, Fairford, UK (TDY KC-135A)**
  - **17th Reconnaissance Wing, Alconbury, UK**
    - 95th RS (TR-1A)
  - **34th Support Squadron, Zaragoza AB, Spain (TDY KC-135)**
  - **306 Strategic Wing, Mildenhall, UK (TDY RC/KC-135, SR-71)**
  - **922nd SS, Hellenikon Airport, Athens, Greece (TDY RC-135)**
- 19th AD, Carswell AFB, Tx
  - **7th BW, Carswell AFB, Tx**
    - 9/20 BS (B-52H)
    - 7 ARS (KC-135A)
  - **340th ARG, Altus AFB, Ok**
    - 11 ARS (KC-135A)
  - **381st SMW, McConnell AFB, Ks**
    - 532/533 SMS (LGM-25C)
  - **384th ARW, McConnell AFB, Ks**
    - 91/384 ARS (KC-135A)
  - **308th SMW, Little Rock AFB, Ar**
    - 373/374 SMS (LGM-25C)
  - **351st SMW, Whiteman AFB, Mo**
    - 508/509/510 SMS (LGM-30F)
- 40th AD, Wurtsmith AFB, Mi
  - **379th BW, Wurtsmith AFB, Mi**
    - 524 BS (B-52G)
    - 920 ARS (KC-135A)
  - **410th BW, K.I. Sawyer AFB, Mi**
    - 644 BS (B-52H)
    - 46 ARS (KC-135A)
  - **416th BW, Griffiss AFB, NY**
    - 668 BS (B-52G)
    - 41 ARS (KC-135A)
- 42nd AD, Blytheville AFB, Ar
  - **2nd BW, Barksdale AFB, La**
    - 62/596 BS (B-52G)
    - 32 ARS (KC-10A)
    - 71 ARS (KC-135A)
  - **19th ARG, Robins AFB, Ga**
    - 912 ARS (KC-135A)
  - **68th ARG, Seymour-Johnson AFB, NC**
    - 911 ARS (KC-135A)
  - **97th BW, Blytheville AFB, Ar**
    - 340 BS (B-52G)
    - 97 ARS (KC-135A)
  - **305th ARW, Grissom AFB, In**
    - 70 ARS (EC-135G/L)
    - 305 ARS (KC-135A/D)
- 45th AD, Pease AFB, NH
  - **42nd BW, Loring AFB, Me**
    - 69 BS (B-52G)
    - 42/407 ARS (KC-135A)
  - **380th BW, Plattsburgh AFB, NY**
    - 528/529 BS (FB-111A)
    - 4007 CCTS (FB-111A)
    - 310/380 ARS (KC-135A)
  - **509th BW, Pease AFB, NH**
    - 393/715 BS (FB-111A)
    - 509 ARS (KC-135A)

12 PASS